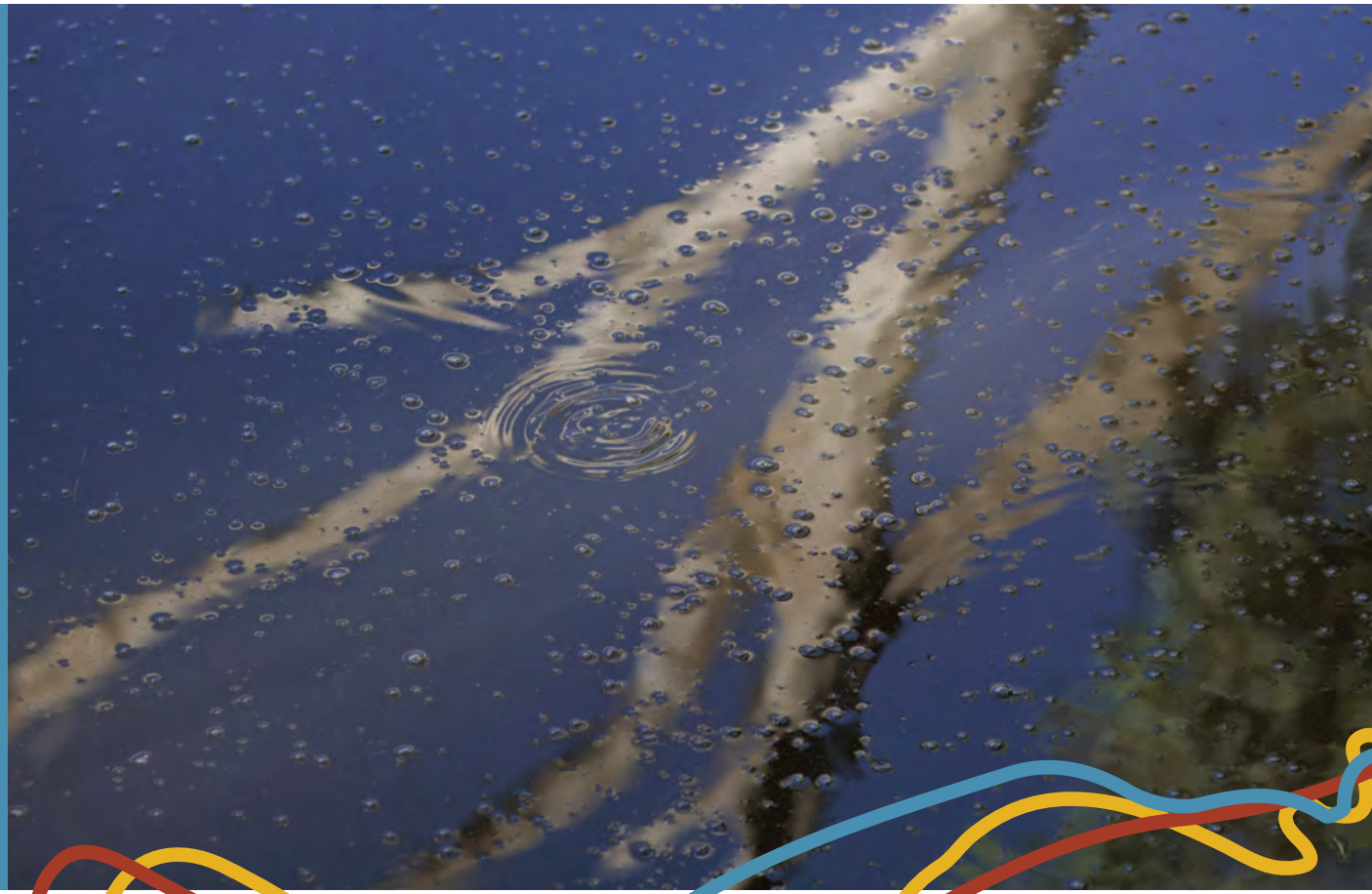
WHAT ARE THE CARP VIRUS BIOCONTROL RISKS AND HOW CAN THEY BE MANAGED?

NATIONAL CARP CONTROL PLAN

The socio-economic impact assessment and stakeholder engagement

APPENDIX 3: Socio-economic impact assessment — commercial carp fishers



This suite of documents contains those listed below.

NCCP TECHNICAL PAPERS

1. Carp biocontrol background
2. Epidemiology and release strategies
3. Carp biocontrol and water quality
4. Carp virus species specificity
5. Potential socio-economic impacts of carp biocontrol
6. NCCP implementation
7. NCCP engagement report
8. NCCP Murray and Murrumbidgee case study
9. NCCP Lachlan case study

NCCP RESEARCH (peer reviewed)

Will carp virus biocontrol be effective?

1. 2016-153: Preparing for Cyprinid herpesvirus 3: A carp biomass estimate for eastern Australia
2. 2018-120: Population dynamics and carp biomass estimates for Australia
3. 2017-148: Exploring genetic biocontrol options that could work synergistically with the carp virus
4. 2016-170: Development of hydrological, ecological and epidemiological modelling
5. 2017-135: Essential studies on Cyprinid herpesvirus 3 (CyHV-3) prior to release of the virus in Australian waters
6. 2020-104: Evaluating the role of direct fish-to-fish contact on horizontal transmission of koi herpesvirus
7. 2019-163 Understanding the genetics and genomics of carp strains and susceptibility to CyHV-3
8. 2017-094: Review of carp control via commercial exploitation

What are the carp virus biocontrol risks and how can they be managed?

9. 2017-055 and 2017-056: Water-quality risk assessment of carp biocontrol for Australian waterways
10. 2016-183: Cyprinid herpesvirus 3 and its relevance to humans
11. 2017-127: Defining best practice for viral susceptibility testing of non-target species to Cyprinid herpesvirus 3
12. 2019-176: Determination of the susceptibility of Silver Perch, Murray Cod and Rainbow Trout to infection with CyHV-3
13. 2016-152 and 2018-189: The socio-economic impact assessment and stakeholder engagement
    Appendix 1: Getting the National Carp Control Plan right: Ensuring the plan addresses community and stakeholder needs, interests and concerns
    Appendix 2: Findings of community attitude surveys
    Appendix 3: Socio-economic impact assessment — commercial carp fishers
    Appendix 4: Socio-economic impact assessment — tourism sector
    Appendix 5: Stakeholder interviews
    Appendix 6: Socio-economic impact assessment — native fish breeders and growers
    Appendix 7: Socio-economic impact assessment — recreational fishing sector
    Appendix 8: Socio-economic impact assessment — koi hobbyists and businesses
    Appendix 9: Engaging with the NCCP: Summary of a stakeholder workshop
14. 2017-237: Risks, costs and water industry response
15. 2017-054: Social, economic and ecological risk assessment for use of Cyprinid herpesvirus 3 (CyHV-3) for carp biocontrol in Australia
    Volume 1: Review of the literature, outbreak scenarios, exposure pathways and case studies
    Volume 2: Assessment of risks to Matters of National Environmental Significance
    Volume 3: Assessment of social risks
16. 2016-158: Development of strategies to optimise release and clean-up strategies
17. 2016-180: Assessment of options for utilisation of virus-infected carp
18. 2017-104: The likely medium- to long-term ecological outcomes of major carp population reductions
19. 2016-132: Expected benefits and costs associated with carp control in the Murray-Darling Basin

NCCP PLANNING INVESTIGATIONS

1. 2018-112: Carp questionnaire survey and community mapping tool
2. 2018-190: Biosecurity strategy for the koi (*Cyprinus carpio*) industry
3. 2017-222: Engineering options for the NCCP
4. NCCP Lachlan case study (in house) (refer to Technical Paper 9)
5. 2018-209: Various NCCP operations case studies for the Murray and Murrumbidgee river systems (refer to Technical Paper 8)

UNIVERSITY OF CANBERRA | HEALTH RESEARCH INSTITUTE

National Carp Control Plan socio-economic impact assessment: Commercial carp fishers

Report of the 'Carp Control: Understanding community and stakeholder attitudes and assessing social effects' project

September 2018

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ACKNOWLEDGEMENTS

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CONTENTS

KEY POINTS – FIRST EDITION

This report is a first edition, which will be expanded as this study progresses. The final edition will include an executive summary. Key points from the first edition are:

- This report examines the potential socio-economic impacts of carp control for the commercial carp industry in Australia
- This report is designed to enable those developing the National Carp Control Plan (Plan) to better understand potential socio-economic impacts on commercial carp fishers, and to use this understanding to design actions to, where possible, prevent or mitigate negative impacts, and provide opportunities for positive impacts
- This report is a 'living document' that will be updated during development of the Plan
- This report is based on interviews and a workshop held with members of the commercial carp industry and industry representatives
- The commercial carp industry in Australia is currently small in size
- This small size reflects multiple constraints that have acted as barriers to industry development, including regulatory constraints and a history of policy change that has limited investment confidence and ability to consistently supply markets, constraints to development of markets, and negative public perceptions of carp
- The Australian Government announced in May 2016 that funding had been committed to development of the National Carp Control Plan: at the time data were collected (April-May 2018), industry participants had experienced two years of uncertainty about the future of their industry
- During this period, impacts experienced by many industry members included financial stress, mental health impacts; some also experienced reduced business investment and market interest
- The proposed release of the carp herpes virus has potential to have multiple impacts that affect the industry, with key concerns raised including concern that:
    - Virus release will have negative impacts on water quality and other species, with concern expressed about environmental impact as well as about potential for impact on the commercial carp industry's business interests
    - Regulators may not permit sale of products that have had contact with virus affected areas (whether or not the product itself is virus-affected), with concern expressed about both domestic and export markets
    - Consumers may be unwilling to purchase products (carp or other products) produced from areas affected by the virus, including products for human or pet consumption, and other products such as fertiliser
    - It may not be possible to feasibly clean up and manage dead carp, with some fishers also concerned that problems in clean-up may be blamed on them if they are involved in clean-up activities
    - Virus release would impact other fisheries due to the issues identified above, and due to some commercial carp fishers moving to operate in these other fisheries, creating increased competition

- The potential impacts on the carp industry include loss of livelihood, particularly for those whose activities rely largely or solely on carp, loss of personal assets such as homes, and mental health impacts
- Many industry members feel that the Plan should include an active role for harvest of live carp, in the short-term to achieve reductions of carp numbers in areas where the virus may be ineffective, and in the long-term to continue maintaining reductions of carp numbers after virus release
- Some felt live harvest should be the principal strategy to control carp while other felt this was unrealistic as it was unlikely commercial or live harvests on their own would be effective, but did believe live harvest had an important role as part of an integrated set of actions to control carp.
- For commercial carp fishers to successfully demonstrate potential of live harvest, or to participate in harvesting dead carp, key constraints affecting the industry would need to be addressed to ensure the activity was not 'set up to fail', particularly regulatory barriers currently constraining industry operation
- The Plan was seen by some as an opportunity to achieve positive change in the form of more consistent and coordinated cross-jurisdictional planning for carp management.
- In addition to concern about potential impacts for their industry, some industry members felt the Plan was creating unrealistic expectations amongst the public, was sometimes over-simplifying key issues in communication, and was being developed over too short a timeframe
- A number of steps were identified that are needed to further assess potential impacts and identify potential strategies to reduce potential for impacts on the commercial carp industry.

This report is a 'living document'. This first edition was written rapidly and will have some grammatical errors as a result. Subsequent editions will update information in this report and report on actions taken to address the 'next steps' identified in this edition.

1. INTRODUCTION

THE NATIONAL CARP CONTROL PLAN

The National Carp Control Plan (Plan) is using research and consultation with stakeholders and community members *to identify a smart, safe, effective and integrated suite of measures to control carp impacts* (NCCP 2017). There is a particular focus on the potential use of biocontrol in the form of the carp herpes virus. Once developed, the Plan will be submitted to the Australian Government, who will make a decision about whether to implement the measures recommended in the Plan.

STAKEHOLDER AND COMMUNITY SUPPORT

The carp control measures developed in the Plan, if approved, will be delivered over a large geographic area and in waterways and waterbodies that are both essential to Australia's agricultural industry and used by millions of recreational users each year. Critical to the success of the Plan is having widespread support from (i) the diverse range of stakeholder groups who depend on or have an interest in freshwater health and carp, and (ii) people living and spending time in the regions affected by carp invasion and in which carp control measures will be implemented.

Support for the Plan will depend on a wide range of factors, including:

- The extent to which people believe investing in carp control is an appropriate and effective way of improving environmental health
- Expected benefits versus costs of the Plan for particular groups or communities
- Trust in the processes and evidence used to develop the Plan, and in the agencies tasked with implementing the actions proposed in the Plan, and
- The perceived environmental, economic and/or social risks of the Plan.

In general, people are unlikely to support actions they feel are unnecessary, likely to be ineffective, have inappropriate impacts, or are highly risky. They are more likely to support actions they feel are necessary, likely to be implemented successfully, likely to be effective, for which they believe benefits will outweigh costs, and which they believe have an acceptable level of risk.

UNDERSTANDING COMMUNITY AND STAKEHOLDER ATTITUDES AND ASSESSING SOCIAL EFFECTS – PROJECT OVERVIEW

As part of the development of the Plan, researchers at the University of Canberra were commissioned to assess community and stakeholder attitudes to carp control, and potential socio-economic impacts of measures proposed to control carp. Overall, this project aims to support development of a Plan that will have support from communities and stakeholder groups, through ensuring the Plan appropriately addresses their needs, concerns and interests. This means that this project is not focused on measuring sentiment about carp control and communication (although these are important and

examined as *part* of the project), but rather focuses on building support for the eventual Plan through:

- Identifying and understanding stakeholder and community needs, concerns and expectations regarding carp control, so these can be acted on throughout the development of the Plan and addressed in the content of the Plan
- Identifying how best to ensure processes used to develop the Plan meet stakeholder needs and expectations
- Identifying potential socio-economic impacts of carp control for different stakeholder groups and communities, and potential measures to reduce negative and maximise positive socio-economic impacts, and
- Understanding the types of information, consultation and engagement needed by different stakeholders in the process of developing the Plan.

This work will inform both the process used to develop the Plan (including communication, consultation and engagement with stakeholders and communities) and the eventual content of the Plan (particularly design of strategies for minimising negative and maximising positive impacts of the carp control actions proposed in the Plan).

This project will also develop a framework for ongoing monitoring and evaluation of socio-economic impacts and community attitudes into the future beyond the life of this project. This is to ensure that it is possible to rapidly identify where action is needed to address community concerns during any future implementation of the recommendations made in the Plan.

PROJECT REPORTS

This project includes several reports:

- Report 1 Getting the National Carp Control Plan right: Ensuring the Plan addresses community and stakeholder needs, interests and concerns
- Report 2 Ensuring carp control is socially acceptable: Understanding key factors likely to influence social acceptability of carp control measures
- Report 3 Stakeholder engagement recommendations for the National Carp Control Plan
- Report 4a,b,c,d (including this report): Socio-economic impact assessment: potential impacts and negative impact mitigation strategies for (i) commercial/contract carp fishers, (ii) tourism-dependent businesses, (iii) native fish breeders and hatcheries, and (iv) the koi industry
- Report 5: Social acceptability of actions proposed for inclusion in the National Carp Control Plan
- Report 6: Monitoring socio-economic impacts and community attitudes: A framework for ongoing monitoring of the National Carp Control Plan.

THIS REPORT

The overall goal of this project is to help those designing the National Carp Control Plan achieve stakeholder and community support for the actions in the Plan. Achieving this has many components: amongst other things, it requires understanding potential impacts of proposed carp control actions on different groups, designing strategies to address these, ensuring appropriate engagement and inclusion of stakeholders in the process of developing the Plan, and informing communication about the Plan.

Understanding potential impacts, and designing strategies to address them, is important as it can reduce potential negative impacts for different groups. Multiple past processes have recommended using participatory processes of consultation and impact assessment during development of new strategies in order to better reduce subsequent negative impacts and challenges. It is essential to do these things during the development of the Plan, as this is the time when it is possible to design actions to avoid or reduce negative impacts, and to maximise potential for positive impacts. For example, Momtaz and Gladstone (2008) found that negative impacts experienced by fishers as a result of estuarine management measures introduced by the NSW government could have been reduced if improved impact assessment and consultation processes had occurred during the process of developing the measures.

This report examines the potential socio-economic impacts of carp control for commercial carp fishers and businesses that utilise carp harvested in Australia. Commercial carp fishers, and the processing businesses that use harvested carp, are directly affected by any actions put in place to reduce carp numbers.

This report is one of four examining potential impacts of the Plan on different groups. Each of the four reports uses a similar approach, and some text about impact assessment is repeated in each report so that each can be read as a 'stand alone' document.

The first edition of this report has been written while the NCCP is still in development, and identifies a range of potential socio-economic impacts at a point at which the exact actions to be proposed in the Plan are not yet known. The intent is to identify the potential for these impacts, so that they can be considered and addressed as part of the design of the Plan, with the goal of preventing or mitigating negative impacts where possible, and providing opportunities for positive impacts where possible.

This report will be updated as development of the Plan progresses. This 'living document' approach is being used to ensure that impact assessment can meaningfully inform discussions about how best to develop carp control actions, *before* decisions are made about those actions. This follows best practice principles of social impact assessment (discussed further in the next section), which emphasise the importance of conducting an iterative impact assessment process that informs development of policies, programs and projects. This is different to traditional impact assessment, which is often undertaken after a

proposed set of actions have been finalised - a point at which it is more difficult to make meaningful changes that can prevent or mitigate impacts (Esteves et al. 2012).

This report should therefore be read as an early impact assessment that has been produced relatively rapidly to ensure it informs discussions. It includes key questions and identifies important areas of assessment that are needed as the Plan is developed. It is intended to inform development of the Plan, and as such is not an assessment of the impacts of the Plan: once the specific actions to be included in the Plan are finalised, a formal assessment of their impacts should be undertaken. The information in this and future editions of this report can help inform assessments undertaken once the Plan is finalised. The report does not attempt to quantitatively estimate potential impacts in terms of numbers of jobs or economic activity lost; this may be possible to some extent in future editions once further assessment is undertaken.The report first briefly explains the areas examined in this first impact assessment report, and why they were focused on. The methods used to assess impacts are then described. Findings are then presented, focusing on understanding (i) constraints and opportunities in the absence of carp control, (ii) impacts of the announcement of the NCCP, (iii) potential impacts of carp control, and (iv) priority areas for further assessment. Finally, next steps in impact assessment are described.

2. SOCIO-ECONOMIC IMPACT ASSESSMENT

Impact assessment means many things to different people. This section explains the approach to impact assessment in this report, and why this approach is being used at this point in development of the Plan.

As noted earlier, starting processes of impact assessment only after decisions have been made about a course of action is not best practice, as it reduces ability of proponents to design their proposed action in ways that prevent or mitigate negative impacts and provide opportunities for positive impacts (Vanclay and Esteves 2011; Arce-Gomez et al. 2015).

As well as undertaking assessment of impacts once decisions have been made, impact assessment should also be a key part of the process of making those decisions. Ideally, impact assessment should be undertaken as proposed actions are being developed to inform the development of those actions. This enables impact assessment to be better used to reduce negative and maximise positive impacts for different groups. When being undertaken during the decision making process, impact assessments should use participatory approaches in which those potentially impacted have opportunity to contribute to assessing impacts and identifying potential prevention and mitigation measures (Vanclay and Esteves 2011; Arce-Gomez et al. 2015).

The first edition of this report examines four key areas important to early impact assessment that is intended to inform development of proposed actions:

- Existing conditions, constraints and opportunities in the commercial carp industry
- Impacts of the development phase of the Plan on the commercial carp industry
- Potential impacts of implementation of carp control, and
- Actions needed to further assess impacts and develop impact prevention and mitigation strategies.

ASSESSING EXISTING CONDITIONS

The existing conditions being experienced by a person, business or industry are an important starting point for impact assessment. Existing conditions, constraints and opportunities will influence how a policy, program or project impacts people and businesses (Schirmer 2011, Loxton et al. 2013). Existing conditions influence the ability of people, businesses and communities to adapt successfully to change, and this is well recognised in literature ranging from that on climate change adaptation, to that on resilience to change, and impact assessment (e.g. Loxton et al. 2013). For example, a farmer experiencing drought may be less able to cope with implementation of reforms that change how they can access water, compared to one who is experiencing normal rainfall conditions (e.g. Schirmer 2017). This principle is just as applicable to assessing the potential effects of the National Carp Control Plan. For example, if businesses are experiencing financial stress before implementation of the Plan, they will have fewer

financial resources to help them adapt to new conditions resulting from the implementation of the Plan. Given this, a key part of our assessment is assessing existing conditions for the commercial carp industry in Australia.

ASSESSING IMPACTS OF DEVELOPING THE PLAN – 'ANTICIPATORY IMPACTS'

Many policies, programs and projects have relatively long development phases, and these development phases themselves have important social and economic impacts, called 'anticipatory impacts'. During this development phase, it is not yet known exactly how the proposed action will impact different people, businesses and communities, but it is known that they may be affected (see for example Loxton et al. 2012, 2013, 2014; Schirmer 2017).

A person who is anticipating a change they feel is likely to affect them may experience a range of impacts. These include mental health impacts such as anxiety and stress-related health problems. These result in particular from experiencing a lack of certainty about the future, and from difficulty making decisions about the future as a result of this uncertainty. Major life decisions such as getting married, having a child, or purchasing a house or car may be delayed. Those who manage businesses may have reduced ability to obtain finance or maintain loans if financial institutions are aware that an action is being proposed that has potential to impact the business in the future. They may also experience changes in their markets as customers switch demand to other providers in anticipation of the action being proposed impacting that business (Loxton et al. 2012, 2013, 2014).

'Anticipatory' impacts can be significant and create long-lasting impacts for households and businesses. It is therefore critical to understand how the announcement of the NCCP has affected people and businesses in the commercial carp industry, and to identify any actions that can be implemented to reduce potential negative impacts during the development of the Plan.

ASSESSING POTENTIAL IMPACTS OF IMPLEMENTING THE PLAN

The way the Plan impacts the commercial carp industry will depend on how it is designed. The design process should consider the potential social and economic impacts different approaches to implementation of carp control may have for different people, businesses and communities. To do this requires identifying the potential ways that different activities being considered for inclusion in the Plan – including but not limited to release of the carp herpes virus – could affect the commercial carp industry. The first edition of this report identifies the range of potential impacts that members of the commercial carp industry have concerns about. Subsequent assessment will focus on more detailed assessment of impacts of the Plan as it is further designed, and on identifying appropriate impact prevention and mitigation strategies.

NEXT STEPS IN IMPACT ASSESSMENT, PREVENTION & MITIGATION

The initial impact assessment presented in the first edition of this report will be continued. This means that as part of this initial assessment it is important to identify the next steps needed to assess impacts, and to design appropriate impact prevention and mitigation strategies.

3. METHODS

Initial assessment of potential impacts was undertaken based on interviews and a workshop were held with members of the commercial carp industry and with a representative who advocates for commercial fishers (including but not limited to carp fishers). .

INTERVIEW SAMPLE

The aim for this impact assessment was to achieve participation in the study from a diversity of representatives of the commercial carp industry, including:

- Commercial fishers for whom carp formed all or part of their fish harvest
- Processors of carp (some of whom are also operating commercial carp fishing businesses)
- Organisations representing the industry, such as commercial fisher representative organisations.

The collective term 'commercial carp industry' is used to refer to the first two groups together. The term 'industry representative' means a person who advocates on behalf of fishers and/or processors and is not considered part of the industry.

Prioritisation was given to including those people for whom carp fishing and/or processing formed all, or the large majority, of their household income, as these were the households most likely to experience significant socio-economic impacts as a result of carp control. However, it was also considered important to ensure that fishers for whom carp fishing forms a smaller part of income were represented in the study, to understand the potential impacts of carp control of them.

Interviews included two interviews (one with a fisher and one with a processor) conducted as part of a first wave of interviews for the broader study this report forms a part of, together with a further eight interviews with individual fishers and processors conducted in the first half of 2018. In May 2018 a workshop was held in Melbourne, attended by 11 fishers and one fishing industry representative, some of whom had also participated in an interview.

In total, 16 commercial carp industry members and one fishing industry representative participated in interviews and/or in the workshop. The industry members interviewed included four currently or in the past involved in processing carp, and 14 involved in commercial carp fishing (some were involved in both processing and fishing, hence the total addsup to more than the 16 individual participants in the study).

Of those involved in carp fishing, some earned most or all of their income from commercial carp harvest, while several earned a small part of their household income from commercial

carp harvest. Exact numbers of each type of interviewees are not given due to potential for identifiability, due to the small size of the industry: there are less than 45 known licences or permits for commercial carp harvest identified across the jursidictions in which commercial carp harvest is permitted. Some of these licences or permits are inactive, and some businesses hold more than one licence or permit, meaning that the number of active fishing businesses is smaller than the number of licences and permits issued.

INTERVIEW AND WORKSHOP TOPICS

Interviewees were asked to discuss the following topics (see Appendix 1 for a detailed list of interview and workshop topics)[1]. In all cases interviewees were asked to describe their own experiences (where relevant), and were also asked to provide their observations of impacts on the industry more broadly:

- HIstory of working in or representing the commercial carp industry
- Effects of the announcement of the National Carp Control Plan on commercial carp businesses and households
- Views about proposal to release the virus
- Views about the methods that should be used to control carp
- Potential impacts of virus release on own business or on industry more generally
- Views on whether some impacts could be avoided, and how
- Advice, ideas or suggestions about cleaning up and transporting/processing dead carp
- Observations of carp aggregations in recent years.

The workshop was held for a day, and involved discussing the topics listed above, while attendees were also asked to identify any other topics they wished to discuss. Appendix 1 provides the draft workshop agenda, which was amended on the day to ensure the workshop discussed the topics of highest relevance to attendees.

DATA ANALYSIS AND PRESENTATION OF RESULTS

All interviews were recorded with permission of the interviewee. Interview data were transcribed. The workshop was not audio recorded; instead, notes were recorded on a computer on the day and on butcher's paper, and analysis of these notes formed the basis of assessment. Transcripts and workshop notes were thematically coded, with themes focused on identifying different socio-economic impacts and the circumstances under which

[1] Note that interviews included asking some questions about potential clean-up of carp and carp aggregations. Questions about clean-up were asked primarily to inform design of the operations strategy of the National Carp Control Plan. Responses about clean-up are only examined in this report where they related to socio-economic impacts.

they were occurring or might occur in future, and other factors affecting the extent to which socio-economic impacts would occur.

The first edition of the report contains no direct quotes from those interviewed. This is because some interviewees have requested they be able to provide feedback on quotes intended for inclusion in the report, to ensure they do not contain information that is commercially sensitive or identifiable. In the second edition, these quotes will be included.

ETHICS

Data collection via interviews and the workshop was approved by the University of Canberra Human Research Ethics Committee, protocol number HREC 17-152.

4. COMMERCIAL CARP INDUSTRY CONDITIONS PRIOR TO ANNOUNCEMENT OF THE PLAN

This section considers current conditions in the commercial carp industry, focusing on the commercial harvesting and processing of wild carp (koi are considered in a separate report in this series).

COMMERCIAL WILD CARP INDUSTRY: OVERVIEW

Unlike many other countries, Australia does not have a large commercial carp industry. Whereas in other countries there are large carp aquaculture industries and widespread human consumption of carp, carp consumption is relatively low in Australia, similar to many other countries with an English-speaking culture (Peteri 2004). In a survey of the Australian population conducted in December 2017, 8.2% of adult Australians reported that they had eaten carp at some point in their life, while 91.8% had never eaten carp. Harvested carp can be used for many purposes other than human consumption, and several markets have been developed in Australia for harvested carp.

The commercial carp industry in Australia includes commercial carp fishers and a small number of processors. The exact number of commercial carp fishers is difficult to define, as while there are approximately 40-45 commercial carp permits or licences issued in total across the three jurisdictions in which commercial carp fishing is permitted (New South Wales, Victoria and South Australia), not all of these are actively used by those who hold them. Each of these jurisdictions has different approaches to regulating commercial carp fishing. A relatively small number of businesses predominantly rely on carp fishing, while others who hold licences fish for carp also hold permits, licences or quotas for other fishing activities, with their income derived from multiple types of fishing.

Harvested carp are currently used for a number of purposes, including bait for other fisheries (in particular the South Australian rock lobster fishery), production of boutique and gourmet food products, production of fertiliser (most notable Charlie Carp fertiliser), and sale for human consumption.

The current commercial industry based on harvesting of wild carp in Australia is relatively small. In both interviews and the workshop held with commercial fishers, participants felt that the small size of the industry was not due to a lack of market opportunity for use of carp, but to a number of constraints that have prevented the development of a larger industry based on harvesting of wild carp.

Other than announcement of the development of the Plan (the impacts of which are examined later in this report), interviewees identified the following issues when asked to describe current conditions in the industry: regulatory constraints, past policy and regulatory changes, lack of access to fishing sites, constraints to development of markets, and public perceptions of carp. These are described in the next sections.

REGULATORY CONSTRAINTS

When discussing challenges in the industry, regulatory constraints were the most commonly raised and discussed issue. These particularly related to obtaining permission to fish for carp, and to having clarity about the environmental and other considerations used to make determinations about giving permission to fish. Less commonly participants discussed constraints related to regulations affecting theuse of harvested carp.

The first challenge was simply that carp populations can travel across multiple jurisdictions, and in each of those jurisdictions commercial carp fishing is managed differently, with differing approaches to providing licences or permits to fish, to approving fishing locations, and to other aspects of regulation. This creates challenges in and of itself to developing a commercial carp industry, as it prevents businesses being able to work across jurisdictional boundaries:

The most common challenge described by commercial carp fishers was obtaining permission to fish. Carp populations are dynamic and change in size and location over time; as a result, carp fishers typically have to apply for permission to fish in specific locations in which they have identified a large carp population. Two issues were commonly identified by carp fishers:

First, some fishers (although not all) described being regularly denied permission to fish in the locations they requested a permit for. The process of applying for permission was described as opaque and frustrating, with fishers describing situations in which regulatory authorities did not provide clear criteria by which decisions were made about whether or not to issue a permit, and in which a range of sometimes conflicting reasons were given for denying permits. In many cases, fishers felt decisions made about refusing permission were unfair, for example the decision might cite potential environmental impacts of fishing on a given species, despite the fishers having provided evidence that their fishing methods would not affect the species cited as the reason for denying permission. This was particularly raised by those operating in New South Wales, but was also described as occurring in other jursidictions. However, a similar number of fishers reported that they had no problems obtaining permits to fish, including some fishing mostly in river systems and some fishing mostly in lake areas.

Second, the length of time typically taken to issue a permit was an issue, with three weeks being common according to several fishers. In the period between applying for and being issued a permit, an aggregation of carp will often disperse with fishing no longer cost effective in the location by the time permission to fish is received.

The large variation in processes for licencing or regulating commercial carp harvest across states also meant that it was very difficult for businesses to operate across jurisdictional boundaries, which reduced ability to follow aggregations of carp through river systems.

These issues sreduced ability of commercial carp fishing businesses to achieve a viable business income, both due to the time and effort spent in applying for permits without having the ability to predict whether a permit would be given for a particular location, and due to the length of time before permits were given. Some reported having infrastructure and equipment that was being underutilised as a result of these issues.. Current regulatory systems in different states do not generally support successful fishing of large aggregations of carp, resulting in fishers often having to decide between fishing an area that has marginal populations of carp, reducing return achieved per unit of fishing effort, or opting not to fish that area at all, by the time they receive a permit.

In the workshop, several attendees felt that development of better coordinated and simplified regulation of wild carp harvest would enable development of an industry that could play a meaningful role in reducing wild carp populations, whether on its own or in combination with other carp control measures. This would take the form of enabling fishers to track and fish carp aggregations across jurisdictional boundaries, as well as supporting research into better understand carp movements and numbers to better identify systems for efficiently harvesting large numbers of carp:

PAST POLICY AND REGULATORY CHANGE

Many fishers had experienced multiple policy and regulatory changes in the commercial fishing sector in recent decades. For some, this had included shifting into commercial carp fishing as a result of structural adjustment in other fisheries they previously held licences in, which had meant they no longer had viable businesses operating in those other fisheries (particularly inland and lake fisheries). Most described experiencing ongoing changes in how fisheries were managed that had significant impacts on their business, and which created constraints for managing their business which many felt went unrecognised by fisheries managers and decision makers. This process of regular change – described as a series of governments making new decisions about fisheries management without considering the cumulative impacts of these changes for commercial fishers – resulted in high levels of stress and fatigue for many of the fishers interviewed. For many it meant they felt they had few resources available, with some describing themselves as having ‘run out of energy’, to cope with further changes being imposed on them.

ACCESSING FISHING SITES

Wild carp occur in large stretches of inland waterways in eastern Australia, including in lakes, dams, rivers and wetlands. Carp populations are dynamic, and large aggregations of carp suitable for fishing can occur in many types of locations. Common situations described by fishers include aggregations against barriers in regulated river systems (e.g. weirs and lochs), and in some river areas such as wetlands or particular parts of river systems, amongst others.

Many of the areas in which carp aggregate are difficult to access. For example, carp may aggregate around a river bend that is accessible only by fire trails in a National Park area, which have to be unlocked by park managers for fishers to access them. In some cases there are long distances to travel on relatively unformed or limited tracks. In other cases carp may aggregate in waterbodies used for irrigation or drinking water supply, in which case there may be restrictions on permitting fishing gear near water supply infrastructure. Many of the dams and water storages in which carp occur have large amounts of dead trees and snags that can create difficulty accessing sites. In particular, there are often limited sites for launching boats into a river or dam.

A common challenge for carp fishers is accessing sites at which there is a known carp aggregation. Assuming permission is given to fish within the timeframe in which a carp aggregation is present at a given location, it is not then always possible to physically access the area with fishing gear. This is not only due to the physical constraints such as lack of access roads or ramps into waterways. Commonly, it is also due to difficulty obtaining permission from managers of land that commercial fishers need to cross to access the fishing site.

Fishers reported regularly experiencing challenges accessing fishing sites, including when having to access sites across both privately and publicly managed land. Refusal of permission to use access tracks was relatively common, including by government staff responsible for publicly managed land. In cases where permission had been given and fishers had attempted to access fishing sites, many had experienced abuse or aggression from nearby residents or land managers despite having access permission. sSome commercial carp fishers had good access to their fishing locations, particularly those fishing in large lake areas. However, for those who did not have easy access to fishing sites, this lack of access represented a significant constraint to their business. The challenges of accessing fishing sites cause stress and reduce ability to successfully fish carp aggregations when they are occurring, as they can result in significant delays in fishing, or in being unable to fish at all.

MARKET DEVELOPMENT CONSTRAINTS

Most carp industry participants felt there were multiple market opportunities for the sale of wild carp harvested in Australia. Several had been expanding their markets in recent years. Key challenges to expansion described by industry members, other than announcement of the Plan, were having a regular supply of carp, constraints to harvest, and challenges of achieving cost-effective harvest.

The key market development constraints identified by carp industry members were difficulties obtaining a large enough or consistent enough supply of carp to be able to commit to supplying potential customers. For those who processed carp, the fluctuating supply of carp meant that investment in freezer storage capacity was often a significant part

of their business costs. This type of investment allows processors to maintain stable production over time, despite fluctuation in the volumes of harvested carp supplied. However, it is only cost effective up to a point, with fluctuations in supply of carp due both to changes in population and regulatory constraints a significant constraint to industry expansion.

Several fishers felt a more consistent regulatory framework could enable more certainty around supply of carp and would support expansion of the industry and enable development of a wider range of markets as well as expansion of existing markets.. Markets discussed (existing and potential) included selling carp for table consumption, a range of human and pet food manufacturing, fertiliser, and other industries.

The other major constraint to market development was cost effectiveness. Carp harvested in many locations in Australia need to be transported relatively long distances to market, with higher labour costs for harvesting and transport compared to other countries in which there is large-scale carp aquaculture. While some fishers felt that wild carp harvested in Australia could attract price premiums in key international markets based on the 'clean, green' image of product harvested in Australia, others felt that there were limits to the Australian industry's ability to supply large volumes of carp (or products manufactured from carp) cost effectively into domestic and international markets.

PUBLIC PERCEPTIONS OF CARP

Public perceptions of carp were discussed as a constraint to the industry by some study participants, particularly those involved in businesses supplying carp for human consumption. These participants identified that negative public perceptions of the desirability of eating carp created constraints on selling into markets. However, they also described having success in challenging these perceptions, and in positioning carp as a food that consumers should reconsider. Most felt that while negative public perceptions were a significant challenge, markets for human consumption of carp do exist in Australia and can be grown.

5. IMPACTS OF DEVELOPING THE PLAN

This section examines 'anticipatory impacts' - meaning how the announcement of the development of the National Carp Control Plan, and subsequent period of development, is impacting those involved in the commercial wild carp industry.

The Australian Government announced in May 2016 that funding had been committed to development of the National Carp Control Plan. At the time of collecting data forthis report, there had been two year since development of the Plan was announced, during which the exact nature of the actions to be included in the Plan, and the ways those actions would affect the commercial carp industry, were not yet known. This meant there had been an

extended period of uncertainty about the future for those involved in the commercial carp industry, with that uncertainty expected to continue until the time a Plan was accepted by the government.

When asked how this period of uncertainty had impacted them, several participants identified the following key impacts:

- Stress, anxiety and more broadly mental health impacts
- Negative image of commercial carp fishers
- Financial stress
- Reduced business investment, and
- Reduced market interest.

A small number of participants (two) identified that the development of the carp control plan had little or no effect on them aside from increasing interest in discussing carp.

STRESS, ANXIETY AND MENTAL HEALTH IMPACTS

Uncertainty about the future, and having a lack of control over decisions that affect you, are well demonstrated to have negative impacts on mental health in the workplace (see for example Pollard 2001). Reflecting this, heightened levels of stress, anxiety and associated mental health impacts have been identified as resulting from processes in which the management of natural resources is changed (Loxton et al, 2014).

Several paticipants identified that they were experiencing stress during the development of the National Carp Control Plan, which was impacting on their health and wellbeing. The levels of stress reported ranged from some who reported relatively low (but still present) stress to very high levels of stress reported by some. TThose whose business depended largely on commercial carp fishing were much more likely to report experiencing very high levels of stress and anxiety.

Stress related to the announcement of the Plan was described as resulting from a mix of factors, including:

- Financial stress due to changes in access to finance and changed market demand after announcement of the Plan (discussed further in the next sections)
- Uncertainty about the future, which resulted in being ‘in limbo’ and unable to make decisions related to the future of their household or business
- Feeling powerless to have a say in decisions being made that would have a profound impact on a person’s life
- Feeling that the impacts of proposed carp control on people whose livelihoods depended on harvest of wild carp were being dismissed, downplayed or ignored
- Feeling that the commercial carp industry was being presented negatively in public discussions about carp control (discussed further in the next section).

When asked to describe how they were feeling in the May 2018 workshop, the words fishers used to describe their feelings were:

- Frustrated
- Disappointed
- Angry/ 'pissed off'
- Tired
- Emotional
- Powerless.

Some fishers described how profound these impacts were: for some, they felt they could never get away from thinking about the Plan and its likely impacts, and some of these found it difficult to sleep or to discuss the topic of the Plan with others due to the level of stress resulting from it. This was in some cases compounded by the high interest shown in carp control by others, meaning fishers were asked to talk about the Plan when it was already causing them high stress, sometimes compounding that stress.

Experience of stress and anxiety was not limited to fishers who managed commercial carp fishing businesses, but also extended to their households, with those who were experiencing high levels of stress often describing their entire household as experiencing high levels of stress.

NEGATIVE IMAGE OF COMMERCIAL CARP FISHERS

Some commercial carp fishers felt that public discussions about the Plan often presented the commercial carp industry in a negative light, something which caused stress for these fishers, and which could have material impacts on them in terms of business reputation, and also in terms of safety. In particular, some fishers were concerned that existing negative interactions with some members of the public who had negative perceptions of commercial fishers could be exacerbated by negative portrayal of commercial carp fishers in discussions about the Plan.

This concern was not held by all: two interviewees specifically stated they did not have concerns about how the commercial industry was being presented in public discourse. However several others specifically identified this issue as a negative impact they were experiencing as a result of the announcement of the Plan.

Those who experienced this impact most commonly felt that the commercial carp industry was being inaccurately presented as (i) an industry that had no scope to expand or grow, (ii) as an industry that had 'failed to thrive' due to a lack of viability, (iii) an industry that had 'failed' to control carp, or (iv) an industry that was seeking a 'hand out' or exaggerating concerns about impacts. In particular, several referred to public discussions in which those promoting the need for carp control using the carp virus had stated that the harvesting

methods (commercial or non-commercial) had been tried and failed and that this therefore justified the use of the carp virus to control carp.

This type of statement was viewed as inaccurate by most commercial carp fishers, who felt strongly that they had not been given adequate opportunity to demonstrate what harvesting of live carp could potentially contribute to controlling carp. In particular, they felt they were being blamed for failing to expand their industry, despite that expansion being constrained by a regulatory environment that acted to significantly restrict potential of the industry. It was also viewed as a criticism of the skills of those in the industry. Commercial carp fishers have specialised knowledge of carp and their behaviour; fishers felt that the knowledge they had built, often over decades, was being ignored and delegitimised by statements such as this. All people who work in skilled jobs expect recognition of their skills, and this is important to a person's mental health. Given the importance of being recognised as a skilled fisher, statements that the commercial industry has 'failed' to control carp create stress for fishers..

Concerns about how the commercial carp industry has been presented in communication has reduced the willingness of commercial carp fishers to contribute their knowledge to carp control efforts. Several carp fishers felt that on the one hand their skills and knowledge were being criticised and 'put down', while on the other they were being asked to share their knowledge to assist carp control planning. Some fishers refused requests to participate in carp control discussions as a result. Some felt the intellectual property they had developed should not be shared unless they had some control over what it was used for. In particular, some wanted to opportunity to use their knowledge to help develop proposals for utilising live harvest as part of a carp control program (discussed further later in this report).

Some participants felt that statements about ineffectiveness of live harvest these ignored existing examples in which, in specific situations, harvesting of carp had been successfully used to reduce populations. In particular, they wanted greater recognition of the success of controlling carp in specific water bodies in Tasmania where the use of sterilised 'Judas carp' fitted with radio transmitters, combined with harvesting of live carp by fishers who tracked the Judas carp, has had success.

More broadly, some participants felt that messages used as part of communicating about the Plan had negative impacts on the image of the industry and reduced marketability of their products. For example, one felt that messaging that suggested carp were bad, and descriptions of them as bottom feeders causing turbidity or dirty water, reduced interest in consuming carp and made it more difficult to develop markets for carp in general.

A smaller number felt that the impacts of the Plan on carp fishers were being dismissed by some members of the public and some proponents of the Plan. They felt there was a view that carp fishers should be willing to bear costs to achieve positive outcomes from carp

control. Three fishers felt they were being perceived as seeking a ‘money grab’ rather than as being legitimately concerned about the impacts the Plan might have for them.

FINANCIAL STRESS AND REDUCED BUSINESS INVESTMENT

Some commercial carp industry members have experienced financial stress as a result of the announcement of the development of the Plan. While this has not been the case for all fishers or processors, with some experiencing no financial impacts from announcement of the Plan, it has been significant for some.

Financial stress, when it has occurred, has typically been a result of either (i) financial institutions tightening terms of existing finance due to concerns that commercial carp businesses may not be viable after any future release of the carp virus, and devaluing of business-related assets used as loan collateral; or (ii) some customers switching demand from commercial carp businesses to other suppliers in expectation of future inability to source carp.

More generally, financial stress has been caused in the form of commercial carp businesses being ‘stuck’ with no ability for owners to successfully sell or plan for the future of their businesses. Prior to announcement of the development of the Plan some businesses had changed hands and it was possible to sell a viable business or a permit/licence to another fisher. Since announcement of the Plan lack of certainty about thefuture of the industry means that it is unlikely any meaningful price could be obtained by a fisher seeking to sell their business.

Lack of certainty about the future, and reduced ability to obtain finance or to have confidence that investment will provide returns, have also led several to halt investment in business. Decisions such as upgrading fishing gear and equipment, or investing in expanded processing facilities, are typically being placed on hold during the development of the Plan as businesses are unable to justify making normal business investments when it is possible their business will not be viable in the near future depending on the actions recommended in the Plan. More generally, it is difficult to hire employees, and some businesses are electing not to hire employees when they cannot guarantee them a future.

REDUCED MARKET INTEREST

Just under half of participants identified reduced market interest as an impact of announcement of the development of the Plan. Some had experienced loss of interest from potential investors and customers after the development of the Plan was announced. This included some who had been in the process of negotiating new market opportunities, with negotiations ceasing or being put on hold due to the uncertainty the Plan created about future supply of commercially harvested wild carp. Additionally, some reported that the announcement of the Plan initially impacted the price of carp sold in key fish markets, although they also reported that prices recovered. This was used as an example of how public communication about the Plan can have unintended impacts on the industry.

Reduced market interest had not been experienced by all participants, but had important impacts for those it did affect. Several felt they were 'in limbo', being unable to invest in business expansion in order to improve business viability, or to divest themselves of their business as uncertainty about the future meant there were no interested buyers.

HIGHER AWARENESS OF CARP

A small number of participants felt the announcement of the Plan had resulted in a higher public awareness of carp, and of the existence of the commercial carp industry. This higher public awareness was in some cases associated with negative impacts, described earlier when negative portrayal of the commercial carp industry was identified. However, some was also identified it as an opportunity to use higher public interest in and awareness of carp to achieve improved management of commercial carp fishing, particularly more consistent regulation and planning for harvest of carp.

6. POTENTIAL IMPACTS OF THE PLAN

This section examines potential impacts of the National Carp Control Plan on the commercial carp industry. The focus of this initial assessment was on identifying key issues to consider as part of the design of The Plan. This is important for two reasons. First, the way the Plan impacts the commercial carp industry will depend on how it is designed: identifying potential impacts enables these to be addressed as part of design of the Plan. Second, the way the Plan is perceived by fishers and industry members will affect how they respond and adapt to it, and hence how the Plan impacts them. Marshall and Marshall (2007) identifies that the ability of commercial fishers to adapt successfully to change depended on how they perceived the impacts of that change, which in turned affected their confidence in their ability to cope with the change(Marshall and Marshall 2007).

Overall, interview and workshop data highlight that the impacts to be considered differ depending on how carp control is done. If carp control centres around release of the carp herpes virus without any complementary use of live harvest of wild carp, there will be very different impacts for the carp industry than if there is either (i) a live harvest strategy preceding virus release, or (ii) a live harvest strategy operating in tandem with and after virus release.

The potential impacts of virus release are described below. This is followed by discussion of the different approaches to inclusion of a live carp harvest strategy as part of the Plan, and the potential socio-economic impacts under this scenario.

SOCIO-ECONOMIC IMPACTS OF VIRUS RELEASE

Study participants were asked to describe potential impacts they would experience if the carp herpes virus is released. Virus release is a key focus of research being conducted as part of developing the Plan, and considered likely by many to form a key part of the Plan.

When discussing the potential impacts virus release would have for them, members of the carp industry typically specified that their views were based on an understanding that virus release would likely result in initial substantial reduction of carp numbers, followed by some rebound of population. Importantly, their expectation (consistent with scientific advice about likely consequences of virus release) was that virus release would not eliminate carp, but would instead substantially reduce carp numbers while having some remaining carp population. The views of carp fishers and other industry members were therefore based on the understanding that there would remain large populations of carp after release of the virus, despite the overall population being reduced.

Perhaps reflecting this, very few discussed issues such as having fewer carp to catch, or needing to fish harder for the same amount of catch, after virus release. Most felt there was likely to still be aggregations of carp to fish, although this was not certain. Rather than

focusing on the impacts reduced numbers of carp might have on their business, the five most commonly expressed concerns were

(i) whether regulators would permit sale of products harvested in virus affected areas or that had used product from these areas
(ii) public perceptions of product harvested in virus affected areas
(iii) the logistics of cleaning up and managing dead carp
(iv) impacts on water quality and other species, and
(v) managing impacts on other industries.

Each of these is described below.

REGULATION OF SALE FROM VIRUS-AFFECTED AREAS

The carp herpes virus is a notifiable disease listed by the World Organisation for Animal Health (OIE), of which Australia is a member country. Several carp fishers believed that they would no longer be able to sell any harvested carp (including those not affected by the virus) into human and pet consumption markets if the carp herpes virus was released. Many believed this would apply to both domestic and export markets, while others believed this would primarily apply to export markets. All wanted clear advice on how release of the virus would affect their ability to sell products, and in particular whether different domestic regulatory authorities would still permit sale of healthy fish harvested in areas where the virus was present, and whether export of fish would still be allowed.

Importantly, this concern did not apply simply to fish that had contracted the virus, but was a concern held about harvest of healthy fish (or other species) from areas in which the virus was present. In particular, fishers were concerned that even when harvesting healthy carp they would be required to provide evidence that the carp were not carriers of the virus, or if harvesting other species that no virus particles were present. If they would be required to demonstrate absence of virus, they asked whether and what type of tests would be available to make this feasible. Most felt it would not be economically feasible to put in place testing regimes to demonstratethe presence or absence of virus, particularly given their business viability is basedon harvesting reasonably large volumes with a relatively low unit price.

Question asked by participants about potential market impacts included the following, and were informed by their understanding of publicly available information on the virus, including information produced by the OIE (OIE 2017):

- How will carp fishers be able to identify whether they have harvested (i) a healthy fish, (ii) a healthy but infected fish that isn't yet showing symptoms, or (iii) an infected fish? Most were aware of likely symptoms shown by infected fish, but were also aware that the virus has an incubation period after infection and

that carp can retain the virus for some time if they are not killed by infection or are in water outside the optimal temperate range (e.g. Dishon et al. 2007).

- How will fishers who are harvesting species other than carp, in areas affected by the virus, identify whether the species they are harvesting is a potential vector for spread of the virus (through transporting virus despite being unaffected by the virus)?
- Which regulators will accept product harvested in areas in which the virus has been released, and which will not, or will accept it only if accompanied by evidence demonstrating it is free of the virus?
- What evidence will fishers be asked to produce by different regulatory authorities to demonstrate their product is not virus affected? Concerns were raised in particular about the difficulty of easily testing for presence of the virus, with a view that it was not feasible in terms of cost, volume or time to test for virus presence. This was of particular concern as Australian wild carp are harvested from extensive interconnected freshwater systems, whereas in other countries carp are in confined aquaculture facilities that are more conducive to using testing.
- Will they be permitted to export product derived from carp, or non-carp products harvested in virus-affected areas?
- Will they be permitted to transport fish harvested from virus affected areas across state or other borders? This was an important question for many who harvest in one jurisdiction and sell the harvested fish across a state border.
- For those who sold carp for use as bait in other fisheries, will the markets those fisheries sell into be affected if they used potentially virus-affected bait? For example, will rock lobster harvested using carp as bait be accepted in domestic and export markets or rejected due to the rock lobster having consumed bait considered potentially affected by the virus?
- What traceability conditions will be placed on carp harvested from different regions?

Given these concerns, many felt that it was likely that post-virus release, the markets for pet and human consumption of wild carp would no longer be viable. This would not necessarily be due to lack of harvestable fish but more due to regulatory requirements that would prevent sale of fish that could not be proven to be unaffected by or not carrying the virus.

If this was the case, several businesses would have to re-tool their business to a new market, as they currently sell into the human and/or pet food consumption markets. For these businesses, this would require considerable investment and time.

PUBLIC PERCEPTION OF PRODUCTS FROM VIRUS-AFFECTED AREAS

Participants raised concerns about how consumers would perceive carp harvested from virus affected areas. In particular, the concerns were (i) whether consumers would still be willing to eat fish, or feed their pets food produced from fish, harvested in virus affected areas, and (ii) whether the 'clean, green' image important to many markets, and to price premiums achieved in some of these markets, would not be able to be maintained after virus release. This was an issue for both harvest of wild carp, and harvest of other fish from areas where the virus was released. Similar to discussions of regulation, questions were raised about how to provide assurance regarding quality and any risks associated with consumption.

A smaller number were concerned that negative perceptions of carp harvested in virus affected areas would affect willingness to purchase and use products other than those involving human or pet consumption, such as fertiliser products. However, this concern was not shared by all, with several feeling there was unlikely to be an impact on consumer willingness to buy products made from carp that were not for human or pet consumption.

CLEAN-UP AND UTILISATION OF DEAD CARP

If the carp virus is released, there will be substantial volumes of dead carp. Fishers discussed their views about whether dead carp could be successfully cleaned up and the role commercial fishing businesses might have in this, potential markets for virus-affected dead carp, and concerns about water quality impacts that could result from large volumes of dead carp. In the following sections, these are discussed with a focus on understanding impacts on the commercial carp industry. Other reports and strategies being prepared as part of the Plan are examining other aspects of the potential environmental impacts of dead carp, clean-up strategies and utilisation.

CLEANING UP DEAD CARP

When discussing the clean-up of dead carp, topics raised included the scope of the clean-up and locations in which it is feasible to conduct clean up, the scale of equipment and personnel needed and the investment required for this, regulatory requirements and responsibilities, occupational health and safety issues, and reputational risk. This topic was mostly discussed by fishers and not processors. While some carp fishers felt that clean up of dead carp might present a business opportunity for them, others were concerned about whether the level of resourcing would be sufficient to cover costs of clean-up, and about the risks involved in clean-up in terms of occupational health and safety and reputation of those engaged in clean-up.

Scope of clean-up across different locations

Fishers discussed how the feasibility of clean-up would vary depending on the location. Some areas are relatively easy to access and work in to remove dead carp while others are

remote or difficult. For example, clean-up would be more difficult and costly where it required access across private land to river locations with no ramps or access points, and in areas such as wetlands or dams with flooded forests and multiple snags, rocks and vegetation.

Feasibility of clean-up also depended on how rapidly the virus spread and the resulting volume of dead carp. Fishers wanted to know more about the findings of research on the epidemiology of the virus, as well as the extent to which there was a risk of unplanned spread of the virus by human and animal vectors (e.g. humans spreading the virus by transporting infected fish, or birds spreading the virus through eating or transporting parts of infected fish to new waterways). This in turn would influence the scope and scale of clean-up activities needed at any given point in time.

Fishers who discussed clean-up wanted see local knowledge drawn on to prioritise areas for clean-up, to understand how they could cost clean-up in different locations, and to know how clean-up would be prioritised across areas. For example, they asked how clean-up would be prioritised between areas with high environmental value (known presence of threatened species, for example) and/or with particular types of economic and social values (e.g. for commercial or recreational fishing, tourism, irrigation, recreation, drinking water).

Investment in equipment and personnel

Most commercial fishers felt that it was important to ensure professionals with the right skills and equipment were engaged to conduct clean-up of dead carp, holding concerns about the capacity of volunteers to be engaged in clean-up activities and related safety issues. Some also felt that volunteers were unlikely to be effective due to lack of willingness to be engaged over a long enough time in what was an unpleasant job, as well as due to occupational health and safety risks. Several identified a need for appropriate investment in supporting people with suitable skills and expertiseto conduct clean-up activities, and in ensuring availability of adequate numbers of clean-up workers with the right skills (e.g. skipper or coxswains licence if operating a boat). To achieve this, most felt that significant investment would be required in a range of equipment that could support clean-up in different locations, as well as in developing appropriate procedures that would protect health and safety of operators.

Key challenges identified included a lack of people skilled in operating equipment likely to be most effective in clean-up, as well as a lack of equipment, including boats, suitable machinery for transport, hand held equipment for removing fish, and appropriate protective gear, amongst others. Different equipment would be neededfor differing locations (e.g. open lake areas with concrete ramps and little vegetation, compared to shallow wetlands with extensive reeds and vegetation and no existing boat ramps). Some fishers felt there would be a need for custom-made equipment, highlighting a need for investment and

preparation prior to virus release in ensuring adequate equipment was available. They also questioned what would be done with equipment post clean-up.

Having skilled operators was also identified as important for addressing animal welfare concerns, with some fishers raising concerns about welfare both of carp and of other animals who may be affected by clean-up processes.

Some participantshad conducted clean-up jobs on fish kills in the past, and discussed key learnings from this experience. In their experience, clean-up was highly labour intensive for even relatively localised fish kills, particularly when extracting fish carcases from areas such as reeds and other vegetated areas.

The transport and storage of dead carp was also discussed, with the key concern being that in their experience, most commercial users of carp required harvest of a live product and could not cope with any decomposition of the harvested fish.

Regulatory requirements and responsibilities

Participants identified a number of regulatory issues they felt required resolution before any business could get involved in clean-up activities. These included:

- What insurance coverage would be put in place for people engaged in clean-up to cover the range of situations they would be entering, which might include crossing private property and entering waterways at sites that were not designated ramps, amongst others?
- Who would police waterways where clean-up was occurring to reduce public interactions with dead carp?
- What types of assessments would be done prior to entering a site for clean-up, and how would they be done quickly enough to enable rapid clean-up? This was asked in regard to assessing potential environmental and cultural impacts of activities such as transporting equipment across land, entering water bodies and water ways, and removing fish in vegetated areas.
- What animal welfare guidelines would be put in place to ensure welfare of any live carp harvested as well as welfare of other animals in the area where clean-up was occurring?
- Which government agencies would have responsibility for dead fish, and whose jurisdictions would different activities fall under?

Occupational health and safety

Concerns about the health and safety of people employed to conduct clean-up were raised by commercial fishers, based on their experiences of removing dead fish, particularly decomposing fish. Key needs identified included:

- Appropriate protocols for reducing incidence of spiking injuries, and ensuring personnel who were spiked by a fish bone, snag or other material had adequate time to heal before continuing clean-up. In particular, there was concern about high potential for infection of cuts and scratches in aquatic environments if adequate protection was not in place.
- Identification and management of any health risks related to poor water quality or presence of pathogens in clean-up areas.
- Identification and management of health risks related to insect and animal activity triggered by dead carp.Dead fish will attract substantial insect activity as well as high feeding activity from some types of birds and other animals. Strategies are needed to protect the health of volunteers, for example reducing potential insect bites, avoiding bird faeces, and reducing risk of encounters with animals such as wild dogs.
- The need to protect animal welfare when engaging in clean-up, for example ensuring no birds are harmed if dead carp they are feeding on are removed.

The final issue raised in relation to occupational health and safety was concern about the safety of those involved in clean-up as the visible 'face' of the carp control plan. Fishers were concerned that they might be subject to verbal or physical abuse if they agreed to be part of clean-up activities, discussed further in the next section.

Reputational risk

A key issue for fishers when considering whether they would be willing to be involved in clean-up, and whether this type of involvement presented a potential positive business opportunity or a negative impact for them, related to their reputation. Many fishers felt they would be expected to be engaged in clean-up, but that they would be blamed if clean-up was not effective. This resulted in a view by some that they would experience negative impacts whether they did or didn't become involved. If they opted not to be involved in clean-up they felt they would be criticized. However, if they were involved and clean-up was unsuccessful due to issues such as under-resourcing, or lack of adequate equipment and staffing, they felt they would be blamed as the public face of the clean-up effort.

This potential for reputational risk meant that some fishers wanted to be closely involved in the design of any clean-up strategy, to ensure all relevant operational considerations were adequately addressed. They also wanted to know the amount of resourcing that would be committed and rates that would be paid to those involve in clean-up to enable them to assess whether being involved in clean-up would have net negative or positive impacts for them.

UTILISATION OF DEAD CARP

Utilisation of carp killed by the virus was discussed by some carp fishers. Key issues raised were that:

- Current markets fishers sell into require fresh resources and will not accept any decomposition or loss of quality in the fish (including both markets for human and pet consumption and other markets such as fertiliser).
- Assuming it was possible to harvest carp soon enough after death to be saleable, would consumers be willing to purchase products made from them? These concerns were similar to those raised about selling product harvested live from areas in which the virus had been released (reported in the previous section), but fishers felt negative consumer perceptions would be much stronger about product produced from carp harvested after they had died from the virus.
- Current markets and storage facilities are not set up to process the large volume of dead fish that carp fishers expected would result from the virus.

Associated with this, several felt it would be challenging to develop markets interested for a volume of supply expected to be very large initially and then tapering off over time as virus kills affected lower volumes of remaining carp over time.

VIRUS TRANSMISSION AND WATER QUALITY IMPACTS

More broadly, several participants were concerned about potential impacts of release of the virus on local water quality, particularly in lakes at the end of river systems. While not all shared the same types of concerns, differentparticipants raised a range of questions related to virus transmission and water quality impacts. Many wanted to see more in-depth and detailed scientific evidence regarding these questions and to engage in discussions with scientists to ensure their research was adequately considering the different water flow, ecological and other relevant processes carp fishers had observed in the regions they fished in.

Concerns about water quality impacts were driven in part by views about how rapidly virus transmission might occur, which would in turn predict the volume of dead carp in water systems at any given time. Some fishers felt that the virus would be likely to have very rapid transmission that could not be controlled, and therefore would result in very large volumes of dead carp that impacted water quality. Key questions related to managing virus transmission included the following:

- How rapidly will the virus transmit between fish and under what circumstances?
- Is modelling of virus transmission considering the risk of 'human vector transmission' – people deliberately or accidentally transporting the virus between locations?

- Is modelling of virus transmission taking into account potential for transmission by birds who feed on dead fish and carry virus between locations (multiple bird species were named e.g. pelicans)?
- How is virus transmission affected by the various barriers and impediments in regulated river systems, e.g. weirs, temperature of water being released from dams?
- Is modelling of virus transmission taking into account the speed at which carp can move through a river system, and any likely carp behavioural responses to things such as presence of dead fish? Several fishers reported that they have observed carp moving long distances very rapidly, and learning rapidly, suggesting there may be behavioural responses to virus release that affect transmission.
- How will events such as unexpected floods or rain events, or drought, change virus transmission?
- To what extent will it be possible to control the rate of virus transmission and spread given the above factors?

Following on from questions about virus transmission, questions related to subsequent impacts on water quality included:

- How are changes in water temperature, flows and other factors being considered in modelling of potential water quality impacts? In particular, some fishers discussed concerns that a virus release might happen at a time of year when a system was already stressed and would more readily reach a 'tipping point' into a negative state. Examples given included times when high temperatures and low water flows meant adding additional stress in the form of dead carp could have large impacts on water quality, or when particular species were experiencing stress than meant they were more vulnerable than usual to any change in water quality.
- Where will (and won't) clean-up of dead carp will and what are the implications for water quality in different locations?

When discussing water quality, several commercial carp fishers discussed their experiences of blackwater events in recent years, and expressed concern that virus release might trigger similar events, and causes impacts such as reduced native fish populations.

MANAGING IMPACTS ON OTHER INDUSTRIES

Fishers raised questions about how to manage public perceptions and potential for impacts on other industries. Many fishers lived in communities that relied on tourism for local jobs, and questioned how to ensure virus release did not negatively impact visitor numbers through impacting on both public perceptions and on water quality. Others discussed

whether there would be impacts on water used for irrigation, with agriculture another key industry in many regions where commercial fishers lived.

INCLUDING LIVE HARVEST IN THE PLAN

Most industry members discussed their views about the potential for harvest of live carp to form part of carp control activities in the Plan. For many, participation in discussions around clean-up, and contribution of their unique skills and knowledge to this, was considered appropriate only if they also had meaningful opportunities to help shape strategies related to the role of live harvest in the Plan.

Key issues discussed included the potential roles of live harvest as part of the Plan; the differences between live harvest for population reduction versus commercial harvest; conditions needed for any live harvest strategy to succeed; and the potential for trialling live harvest as a way to 'fish down' (reduce carp populations) in specific areas.

ROLES OF LIVE HARVEST IN THE PLAN

Carp industry members often felt that live harvest of carp should play an important role in the Plan whether or not the virus is released, based on the expectation that available carp control options, such as the carp virus, may reduce numbers of carp but will not achieve elimination of carp:

Some commercial fishers advocated for live harvest as the principal strategy to control carp. Others felt this was unrealistic as they believed it was unlikely or live harvests on its own would be effective, but did believe live harvest had an important role as part of an integrated set of actions to control carp.

In the shorter term, members of the industry felt that live harvest was a critical strategy to consider using in areas where virus release was expected to have limited or no likelihood of success, particularly where water temperatures were outside ranges that support virus transmission (for example, where water temperatures are too high, and in areas where water temperatures are regularly too cold such as outlets below dams). It was also considered important in areas where virus release may be inappropriate for other reasons, for example because of potential impacts on recreational use of an area.

In the longer-term, most felt it was critical to ensure the Plan includes a strategy for maintaining capacity for live harvest of carp, to ensure this method can be used to assist in reducing carp populations.

Several felt that the research being undertaken for the Plan was in many cases equally applicable to development of a live fish strategy as it was to assessing potential release of the virus and clean-up of dead carp.

In addition to contributing to long-term reduction of carp populations, one industry member felt that including live harvest by the carp industry could improve the social acceptability of carp control:

Having a clear statement about the inclusion of a role for live harvest in the Plan would assist in terms of ensuring recognition of the commercial industry as experts in the area, and some (not all) felt this would improve social acceptability of the Plan more generally.

HARVESTING FOR POPULATION REDUCTION VERSUS COMMERCIAL RETURN

A key challenge for a live harvest strategy is identifying where there is potential for harvest that has commercial return, versus where a live harvest strategy cannot be commercial and would require support. Essentially it is likely that a live harvest strategy involving actively fishing to reduce carp populations in specific areas would rapidly become non-commercial, with initial high volume catches for low effort followed by increasing fishing effort being required to achieve a given volume of catch. Particularly in the context of an existing market that has low prices for carp, there is an important point beyond which some felt live harvest could contribute to population reduction, but would not be commercially feasible without provision of incentives from the government, for example ecosystem services payments. However, maintaining some commercial sale of fish was considered by most to be a useful strategy for reducing costs. Some also felt that markets could be developed based on the 'clean, green' aspect of carp control using live harvest.

CONDITIONS NEEDED FOR LIVE HARVEST TO SUCCEED

For any live harvest strategy to succeed, fishers identified three key conditions (beyond establishing incentives for live harvest).

The first was assistance to investment in the equipment needed to scale up live harvest to a point where it could successfully contribute to population reduction. For example, being able to invest in mobile plants or freezer trucks was discussed. Particularly if harvest is intentionally designed to continue beyond points where costs can be covered from commercial sale of fish, it would be essential to realistically identify the support required from government, as financial institutions would not be willing to provide finance for non-commercial investment. Government support would enable rapid scaling up for a live harvest strategy.

The second key issue was establishing a supportive regulatory environment. Several felt that this type of reform is also needed for clean up of dead carp. A key step would be agreement across jurisdictions for states to act cooperatively to support harvest and removal of carp as part of the national Plan, and to commit to regulatory reform to support this. In particular, a need for a more rapid processes of approving permits to fish, for access to fishing sites, and for transport of harvest across jurisdictions were identified, together with consistent

application of any reform by on-ground fisheries officers. Without this type of regulatory reform, fishers felt any live harvest strategy would be 'set up to fail'.

The third area discussed was the potential to use water flows to facilitate greater success of live harvest efforts. Fishers described options for managing water flows based on their experience and observations of how carp populations shifted in different situations. For example, some felt that if water flows could be managed in the right ways at the right time, the 'fish catch themselves' as it was possible to shift carp to a barrier such as a barrage or wall and harvest them. By targeting water flows to shift carp to places where harvest was easier, they felt the cost of fish removal could be reduced compared to the cost of cleaning up dead fish in hard to access areas after release of the virus.

TRIALLING A LIVE HARVEST STRATEGY

Several fishers argued that a trial of a live harvest strategy should be undertaken to better identify the potential of live harvest when undertaken without the constraints that currently limit the existing commercial industry. They felt that a live trial was more appropriate than using modelling or other approaches to assessing potential of live harvest. They felt that the period in which research on the carp virus was being conducted, and relevant approvals gained, provided an opportunity for this type of trial. What a trial would look like varied depending on the fisher discussing it: some discussed relatively contained case studies of specific waterways or waterbodies and trialling different methods such as combining use of Judas carp (carp fitted with radio transmitters) and harvest. Others discussed having a multi-year trial across relatively large areas. The specific design of the trial would vary depending on the types of waterways or waterbodies targeted with differing equipment and fishing strategies likely to be needed. If a live harvest trial occurred, those advocating it felt it would enable them to demonstrate what was possible to achieve if fishers had the opportunity to collaborate on the design and implementation of such a trial, and if there were. clear metrics for identifying and measuring outcomes of a trial.

IMPROVE CROSS-JURISDICTIONAL CARP MANAGEMENT PLANNING

The Plan was seen by some as a potential opportunity to achieve positive change in the form of more consistent and coordinated cross-jurisdictional planning for carp management. If this occurred, and if it addressed some of the constraints noted elsewhere in this report, it could provide greater opportunity for continued activity of the commercial industry.

More generally, achieving a more supportive cross-jurisdictional environment was viewed as an essential step if commercial fishers were to be better enabled to use live harvest as part of the Plan.

IMPACTS ON OTHER FISHERIES

Earlier sections of this report identified concerns that fisheries other than commercial carp could be impacted by virus release, with specific concern expressed about effects of any impacts on water quality or markets for products from virus-affected areas.

In addition, some commercial carp industry members felt that reducing carp numbers would impact on other fisheries more generally, through increasing use of existing licences in those fisheries. Several carp fishers also hold licences in other fisheries, and it was considered likely that if they could no longer harvest carp they may shift into other fisheries. More broadly, this was described as potentially occurring if other inland and estuary fisheries were affected by impacts of virus release.

There was also potential for impacts on other fisheries via the impacts of loss of cheap bait. Carp are used as bait in other fisheries including rock lobster and yabby fisheries, and loss of a cheap and effective source of bait may have impacts on those fisheries currently using this bait. This in turn will impact some commercial carp fishers who also hold licences in other fisheries, and who fish for carp to use as bait in their other fishing activities.

IMPACTS OF LOSS OF BUSINESS

Most fishers did not discuss in depth the potential impacts of closure of their commercial carp fishing activities. This is one of the potential impacts of the Plan depending on how it is designed. Instead, when asked to discuss impacts, most focused on identifying how the Plan could be designed to prevent this worst-case scenario. However, the following impacts were identified, which are consistent with those identified in past studies examining impacts of closure of commercial fishing businesses (e.g. Borgen et al. 2002, Fowler and Etchegary 2008, Gien 2000, Momtaz and Gladstone 2008):

- The impacts will be greatest for those fishers who do not have other commercial business or income earning activities to ‘fall back on’. Several fishing businesses fall into this category, and some processors. Others currently earn a significant proportion of their income from activities other than commercial carp harvest. This means that impacts will vary between fishing businesses, and also between processors, with processors having varying ability to switch to use of inputs other than carp.
- Difficulty finding alternative income opportunities. There are limited job opportunities in many of the local communities those involved in commercial carp harvest and processing live in, creating challenges for findings new work. Additionally, it would likely be difficult for many to develop a new business or find a new job that gave them a similar level of satisfaction or quality of life to their existing work. Some fishers have limited formal qualifications or ‘tickets’ for their skills, meaning their existing skills are not always readily transferable to other industries.
- Loss of a fishing business is about much more than loss of income. Most fishers identified that they would experience negative psychological impacts if they were no

longer able to do a job they loved. Similarly many past studies of the impacts of fisheries closures have identified significant psychological and mental health impacts on fishers and their households who lose access to commercial fishing (see for example Smith et al. 2003; Allen and Gough 2006; Momtaz and Gladstone 2008). The mental health of impacted industry members would need to be supported to help them cope with impacts of loss of business activity if it occurred. impacts

BROADER VIEWS ABOUT PROCESS OF DEVELOPING THE PLAN

Industry members also provided some broader views about the process of development of the Plan, which did not necessarily change how they felt they would be impacted by the Plan. These included:

- Concern that communication about the Plan was creating unrealistic expectations amongst the public, particularly an expectation that controlling carp would result in rivers running clear and rapid positive ecological responses in the form of increased native fish populations. Industry members felt the reality was that any benefits would take much longer to occur and may not be as readily observable as suggested in some materials.
- Concern that high momentum for the Plan would result in pressure to 'do something' even if the actions implemented were not the best response.
- Concern that the Plan was being developed over too short a timeframe. This concern expressed by many participants, including those who reported experiencing negative impacts during development of the Plan. Some of those who were experiencing negative anticipatory impacts still believed that the Plan should be developed over a longer period, even though that might exacerbate the stress they were experiencing.
- Concern that communication about the Plan was over-simplifying some issues.
- A desire for greater clarity about the types of actions being considered for inclusion in the Plan, and how risk mitigation planning would be used to managed key issues of concerns, such as risk to water quality.
- A desire for greater clarity about the short-term versus long-term strategies to be included in the Plan, for example if virus transmission requires large carp aggregations, how this could be achieved in re-releases of the virus after an initial knock-down of carp.

7. NEXT STEPS AND ACTIONS TAKEN

This section documents 'next steps' identified at different stages of this impact assessment, and will be updated over time to reflect what actions were taken, and additional actions that need to be taken.

NEXT STEPS - JUNE 2018

The initial impact assessment presented in the first edition of this report will be continued. This section identifies the next steps needed to further assess impacts, and to design appropriate impact prevention and mitigation strategies, based on the findings of initial assessment work. The 'next steps' identified were current as of June 2018. Later updates of this report will identify actions and outcomes relating to these next steps.

The next steps identified fall into three areas:

- Addressing impacts occurring during development of the Plan
- Involving commercial carp industry members in development of the Plan
- Improving understanding of the likely impacts of different carp control strategies proposed for inclusion in the Plan.

REDUCING IMPACTS DURING PLAN DEVELOPMENT

The following were identified as potential steps to reduce impacts experienced by commercial carp industry members during development of the Plan:

1. Ensuring appropriate communication about the commercial carp industry. This action involves ensuring that communication referring to the commercial industry does not imply failure on the part of the industry to control carp. Communication needs to recognise the knowledge, expertise and skills of those in the industry, and where appropriate identify the potential roles for the commercial carp industry as the Plan is developed. This can occur through briefing of communications managers and scientists who may produce reports that refer to the industry.
2. Further consider whether to provide formal advice to fishers about expected length of time before implementation of the Plan. This type of advice, in the form of a letter or other document, may provide reassurance to some markets or financial institutions that there remains a viable commercial industry. However, some felt that this would have limited, if any, benefit as until actions to be included in the Plan are finalised it is not possible to assess the full impacts on the commercial carp industry. Hence currently reassurance on the viability of the industry can only be given for the period prior to implementation of the Plan. Initially, potential for this type of letter will be identified through raising this option with the Policy Advisory Group. Whether it should be distributed will be discussed further with fishers prior to issuing any document.

3. Enable fishers and other industry members to contact each other, through sharing contacts. Industry members did not always have each other's contact details, and found being able to share experiences could assist in coping with some aspects of development of the Plan. Fishers will be contacted and asked if they are willing to have their contact details shared with other fishers. Fishers would then consider how best to communicate amongst that group, for example through meetings or other mechanisms, or through the Bang the Table site being used by the NCCP.
4. Consider providing access to mental health resources that can be used by commercial fishers and industry members, with a focus on identifying resources that would be meaningful and useful. Given that fishers live in a number of locations, any support provided would need to be available across geographic locations. However, there is a need to ensure any access to counselling was with people who were familiar with the types of stress that can result from proposed changes in access to resources people depend on for their livelihoods. There is also a need to realistically assess whether fishers are likely to access mental health support, or whether encouraging other avenues, such as access to local GPs, was a better option more likely to be utilised by fishers. Organising talks about coping with stress was another option raised by one fisher. The next steps are investigating the possible options and resources for achieving this.
5. Consider requesting that fishers be given reduced or waived fees related to their carp fishing business while the Plan is being developed. Some fishers described this as a 'drop in the water' and were concerned it might be used as a way of 'being seen to do something when you're really not'. However, it may to a relatively small extent reduce some financial stress, as long as it is not considered the sole method for providing some support to fishers.
6. Ensure industry members are given opportunities to supply carp when it is needed as part of research projects conducted for the Plan. This can be achieved through agreeing a protocol for sourcing carp with industry members and then ensuring all scientists seeking to use carp in research comply with this protocol.

INVOLVING COMMERCIAL CARP INDUSTRY IN PLAN DEVELOPMENT

The following were identified as potential steps to better involve members of the industry in development of the Plan:

7. Include a commercial industry representative on the Operations Working Group, to ensure that views and knowledge of fishers can be represented, and to ensure that progress updates can be provided by that representative back to commercial fishers. Provide appropriate support to enable that representative to consult other fishers, and to travel to and participate in meetings.
8. Ensure industry members are given opportunities to engage with scientific data from research being conducted for the Plan, and to have dialogue with the researchers

producing it. Options discussed included online forums, workshops and site visits with both commercial industry members and scientists. This included discussions around risk assessment, environmental outcomes, impacts on native fish and other species, biomass assessment and virus epidemiology.

9. Involve commercial industry members in assessment of regulatory barriers and identification of strategies to address these.
10. Support members of the industry to have further meetings to discuss the Plan and identify shared views on actions proposed for the Plan, and recommendations to be made to those developing the Plan.

FURTHER WORK TO ASSESS IMPACTS

The initial assessment has identified areas where more information is needed in order to assess potential impacts:

11. Assess how consumer perceptions and market demand for carp are likely to change if the virus is released. This is necessary before it is possible to identify the extent to which businesses will be impacted.
12. Identify regulatory responses to virus release and whether these are likely to reduce access to markets. This requires assessment by experts in regulatory and biosecurity issues.
13. Identify whether existing regulatory challenges can be reduced, as this affects the viability of businesses and the extent to which they will be able to adapt to change.
14. Draw on results of other projects to identify realistic scenarios of change in carp populations over time and assess how these would affect ability of commercial businesses to catch fish. This assessment also needs to take into account the extent to which the market/consumer and regulatory environments are supportive of maintenance of a commercial industry.
15. Clarify whether support can be provided to commercial fishers and processors of carp to assist them in adjusting to changed conditions that result from the Plan. If there is potential, there is a need to provide advice on the best options for providing support, drawing on past experiences.

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APPENDIX 1

This appendix contains the interview questions asked of people involved in commercial carp fishing. These questions were sent to interview participants prior to the interview, and the interviewer then went through these questions. Prompts were used to raise specific topics if the interviewees did not raise them, with the interviewers keeping a list of common topics raised and describing these at the end of the interview and asking if the interviewees had any views about each.

National Carp Control Plan: Assessing socio-economic effects

INTERVIEW QUESTIONS – COMMERCIAL/CONTRACT CARP INDUSTRY

This document lists the questions we will ask as part of talking to you for this project. Please note that you are encouraged to talk in as much detail as you wish to, and that we will also ask you to raise any other topics you wish to discuss.

1. Could you tell me a bit about your history of commercial/contract carp fishing or working in processing carp?
2. What effects has the announcement of the National Carp Control Plan had for your business and for you personally? Have there been impacts on your business, or your household?
3. Do you think the proposal to release the virus is a good idea? Why or why not?
4. What are your views about the methods that should be used to control carp?
5. If the carp herpes virus is released, what are the potential impacts on your business? You don't have to be certain they will happen – we'd like to hear about the impacts you worry might happen, and any positive impacts you think might be possible.
6. Next we want to ask your views on whether some of those possible impacts could be avoided. What could be done to help reduce the potential for negative impacts, or to increase the chances of positive impacts?
7. Is there anything else you'd like to discuss before we move on to talking about clean-up?
8. Next we will ask for your advice, ideas or suggestions about clean up and transporting/processing dead carp. This will include discussing your experience of removing dead fish from waterways (if you have been involved in this), your views on the methods likely to be most and least effective for removing large volumes of dead carp from different types of locations (e.g. rivers, small tributaries, lakes, etc), and your views about potential challenges in removal, transport, disposal and processing of large volumes of dead carp.

9. Carp aggregations. We will ask where you have observed carp aggregating in the last five years, and what conditions you have seen them aggregate in (e.g. time of year, flow conditions, temperature). We may also ask if you're willing to talk in more detail about this with researchers involved in looking at these issues.

Commercial/contract carp fisher workshop

8.00am-3.00pm, Friday 18 May, Mantra Tullamarine

DRAFT Agenda

8.00	**Tea and coffee**
8.15	**Introductions & purpose (Jamie)** *NCCP to outline how the meeting came about and its purpose*.
8.30	**Workshop planning (Jamie)** *Attendees will be asked to identify what they would like to see come out of the day and key topics they'd like to discuss. We will come back to this list during the day to check what has and hasn't been covered and ensure we cover different issues. The Agenda may be altered based on discussion here.*
8.50	**Socio-economic impacts – background (Jacki)** *What is impact assessment, how it is done, how it will be used to inform development of the Plan, and key challenges.*
9.00	**Socio-economic impacts – current impacts of Plan development process (Jacki)** *In this session we want to discuss the impacts the proposal to control carp is currently having on commercial/ contract carp fishers, and to identify any actions that can be recommended to help reduce these impacts.*
9.40	**Socio-economic impacts – other current challenges (Jacki)** *Several commercial carp business operators have identified that there are multiple existing challenges for the commercial carp industry (for example, regulatory constraints and long approval processes that reduce ability to target aggregations when they are happening). We will discuss these and their impacts.*
10.00	**Morning tea**
10.30	**Socio-economic impacts – potential impacts of reduced carp numbers (Jacki)** *We will discuss how (i) smaller reduction of carp numbers e.g. 20%-30%, versus (ii) larger reduction of numbers e.g. 60%-70%, would impact businesses. We won't ask about specific impacts on your business (to ensure privacy) but will ask for general discussion about potential impacts on:* (i) Business costs (fuel, labour, other costs incurred per unit of catch) (ii) Ability to supply carp/carp products reliably to customers (iii) Other markets/sales aspects (e.g. market confidence to buy carp-derived products) (iv) Other businesses (other fisheries, supply chain, etc) (v) Your household *For each, we'll discuss how this aspect of commercial carp businesses might be affected, and any actions that could be recommended in the Plan to address potential impacts.*
11.30	**Discussion (Jamie)** *We will discuss issues raised in the 'workshop planning' session that are not being covered elsewhere in the workshop*
12.00	Lunch
12.30	**Clean-up (Jamie)** *We will discuss views about clean-up including feasibility, challenges, methods, possible involvement of commercial fishers, and any other views and ideas about clean-up and operations in general.*
2.00	**Discussion (Jamie)** *Discussion on topics that have emerged during the workshop and during the project planning session.*
2.30	**Ideas and actions moving forward (Jamie)** *We will discuss what happens next including specific actions, and ask how to best keep discussions happening. Evaluation of the success of the day.*

NATIONAL CARP CONTROL PLAN

The National Carp Control Plan is managed by the
Fisheries Research and Development Corporation

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