Review of the national recovery plan for the Tasmanian Giant Freshwater Lobster *(Astacopsis gouldi)*

INTRODUCTION

This document reviews the implementation of recovery actions, and progress in meeting plan objectives, for the *Giant Freshwater Lobster Recovery Plan 2006-2010*. The review also aims to document the current state of the Tasmanian Giant Freshwater Lobster, its conservation trajectory, and any change in management actions or priorities necessary for its recovery.

The review was populated during a workshop of managers and experts, held in Hobart on 30 April 2015. The review was conducted by the Department of the Environment (see Attachment A for full list of participants).

The information in the review will be used to inform a decision by the Minister on whether a recovery plan is still required; and subsequently if a recovery plan is required, a decision on whether the existing plan is varied or a new plan prepared.

The review comprises four components as follows:

1.0: PROGRESS OF RECOVERY ACTIONS

2.0: EVALUATION AGAINST OBJECTIVES

3.0: CHANGES IN KNOWLEDGE AND CONSERVATION TRAJECTORY

4.0: RECOMMENDATIONS

ACRONYMS

CCNRM	**Cradle Coast Natural Resources Management**
CFEV	**Conservation of Freshwater Ecosystem Values**
DotE	**Department of the Environment**
DPIPWE	**Department of Primary Industries, Parks, Water and Environment**
EPBC Act	***Environment Protection and Biodiversity Conservation Act 1999* (Cwth)**
FPA	**Forestry Practices Authority**
IFS	**Inland Fisheries Service**
IUCN	**International Union for the Conservation of Nature**
NRM	**Natural Resources Management**
RFA	**Regional Forestry Agreement**
TEFLOW	**Tasmanian Environmental Flows**
TSP Act	***Threatened Species Protection Act 1995* (Tasmanian)**

1.0: PROGRESS OF RECOVERY ACTIONS

1.1: Evaluation of progress on recovery actions

*Status progress: 0 = No progress
1= Action underway
3 = Completed

Specific Objective 1: Reduce and eliminate fishing pressure.		
Actions	**Implementation details**	**Status**
1.1 Continue a community education and awareness program on *A. gouldi* conservation: a) Investigate opportunities for development of minimal-impact nature-based tourism ventures. b) Reprint fact sheet, colour brochure, posters and stickers, and develop new materials.	1.1 Varied progress - some actions not implemented, some underway and some completed: a) Unknown as to what extent this action has occurred. Todd Walsh ran a small ecotourism operation in the past but found that it was not economical – the model involved taking people out and showing them lobsters in the wild. Lobster Ponds at Flowerdale are running a small operation (however, some concerns were raised over methods as there had been reports of the death of some lobsters). Seahorse World, and the Lobster Ponds, currently have permits to take and display lobsters. *Recommendation – Workshop participants stated that breeding for sale to the public should not occur. It was suggested that any future tourism venture would be better done on a larger scale (e.g. Cradle Coast Natural Resources Management (NRM) would be well suited to build a facility to showcase lobsters and provide informative displays). However, it was largely agreed that this action does not add significant value to species recovery efforts and could be left out of a future recovery plan. There was some suggestion that allowing strictly licensed export of animals to major mainland aquariums for outreach to the broader Australian community could be considered in the future.* b) Existing material has not been reprinted and distributed and new informative material has not been developed. No progress has been made, resource constraints prevented implementation of this action. Inland Fisheries Service (IFS) had a brochure that could be updated and reprinted. Information is available on the internet (e.g. the Tasmanian Department of Primary Industries, Parks, Water and Environment (DPIPWE) have an online fact sheet). The previous 'Care for the Lobster' poster was very popular with schools. NRMs and Waterwatch were active in the past (outreach also helped inform about fishing bans). *Recommendation - Reprinting materials would be beneficial.*	1

c) Advertise extensively about regulations in newspapers, the IFS newsletter, angling magazines etc.	c) Regular advertising of fishing regulations has not occurred. There is, however, information on the regulations available on the IFS website and the Freshwater Angling Licences contain information on species that cannot be taken (e.g. *A. gouldi*). *Recommendation – advertising of the fishing ban could be undertaken in the future, however there are other actions that are of a higher priority (e.g. compliance and monitoring).*	
d) Add lobster information to the IFS website and link to other relevant sites.	d) An information page on the species has been added to the IFS website but links to other information sources appear to be missing. Conclusion is that the IFS website is currently out of date and could be improved. *Recommendation – the IFS website should be updated to provide links to other information sources, such as the DPIPWE fact sheet. The listing statement for this species (for the Tasmanian Threatened Species Protection Act 1995 (TSPA)) is currently in draft.*	
e) Develop signs and place prominently on bridges etc advising of the ban on fishing.	e) Signs have not been developed and displayed. Signs may however be removed or defaced quickly if they were erected so may not be an efficient use of resources. *Recommendation – this action is not likely to be effective in improving the conservation status of A. gouldi and does not constitute an efficient use of resources.*	
f) Produce tags or tape to label bait-line stumps (after bait-line removal) with information on the fishing ban.	f) Tags and tapes have not been produced. Bait-line monitoring is not likely to be an effective guide for the amount of fishing occurring as they would not be left at a site where poaching/illegal fishing is occurring and poachers are more likely to use traps. *Recommendation – this action is not likely to be effective in improving the conservation status of A. gouldi and does not constitute an efficient use of resources.*	
g) Provide information material to agricultural industries.	g) Information material does not appear to have been provided to agricultural industries. Waterwatch have had engagement programs with agriculture and some successful replanting has occurred in certain catchments. Cradle Coast NRM is looking into revegetation plantings in the Duck River agriculture area. Inglis River is a successful area for working with agricultural communities. *Recommendation – there are opportunities available to do more work with agricultural communities to improve the conservation status of A. gouldi*.	
h) Publish articles in industry newsletters as part of an awareness program for the forest industry and run presentations at field days and Forest Practices Officer courses (and link with monitoring of *A. gouldi* populations in forestry areas).	h) DPIPWE and the Forestry Practices Authority (FPA) have developed forest practice plan policies and procedures and have conducted awareness raising activities at field day events. FPA continue to run a training course every few years, have produced a technical note on identifying lobster habitat in headwater streams and currently have an honours student looking at the effectiveness of management in plantation areas. *Recommendation – current actions should continue.*	

i) Promote lobsters as a flagship species for good catchment management.	i) Regional NRMs and land protection programs have promoted lobsters as a flagship species. This action has been well implemented in the north-west, but little has occurred in the north-east. FPA work is ongoing. *Recommendation – this action should be continued, with particular attention given to promoting the species in the north-east*.	
1.2 Enforce the fishing ban. a) IFS to lead routine, high-profile enforcement effort including surveillance, apprehension and charging of offenders and prevention of illegal trade (recommended that action commence immediately and continue for the first 3 years of the recovery plan with routine enforcement continuing indefinitely). b) As a minimum the equivalent of at least one of the existing IFS enforcement staff will focus on *Astacopsis* issues at half time for 6 months of year (i.e. 0.25 FTE). c) Reprint and distribute an existing brochure for IFS and PWS enforcement staff and Tasmania Police showing	1.2: Varied progress - some actions not implemented, some underway and some completed: a) Enforcement is undertaken collaboratively between IFS, DPIPWE and Parks and Wildlife Service (PWS) compliance officers and surveillance cameras are also used by the enforcement team (there were 3 convictions for *A. gouldi* poaching in 2013 and 2 in 2014). However, resource constraints limit the amount of compliance activities. Most compliance undertaken in relation to *A. Gouldi* is undertaken in conjunction with other compliance efforts (e.g. checking whitebait traps) and is not targeted. Fines may not be being applied as effectively as they could (e.g. offenders often receive minimal fines, such as $800 fines being issued when up to $10,000 fines could be applied). Incremental increases in fines are also not occurring, thus the potential to deter repeat offenders may not be being utilised as effectively as possible (e.g. fines are not ramped up for each repeat offence). Lobsters are still very valuable on the black market (e.g. >$100 per individual) and thus there is still an incentive to engage in poaching activities. Overall compliance and enforcement activities are possibly complicated by the fact that multiple tenures are involved (e.g. PWS staff have authority to conduct enforcement activities in parks only, while the DPIPWE capacity to carry out enforcement activities is tenure free however there is a shortage of enforcement officers to conduct flora and fauna enforcement activities; it is a similar situation for IFS). There are also multiple pieces of legislation under which prosecution can be brought which can cause further confusion. *Recommendation – enforcement of the fishing ban is still needed for this species but the tactical focus should change, as while intensive, widespread illegal fishing is likely to have decreased significantly, the actions of a few professional poachers can still have significant consequences. Enforcement activities would also benefit from joint cooperation between staff from PWS, DPIPWE, IFS and the police force.* b) While enforcement has been occurring, the target of 0.25 FTE per year has not been reached. Poaching is less of an issue overall than it has been previously but still needs to be addressed. *Recommendation – as above, enforcement should continue, known professional poachers should be targeted and consideration should be given to undertaking enforcement activities jointly.* c) Unknown whether reprinting of brochures and distribution to compliance staff has occurred. *Recommendation – material should be updated, reprinted and provided to enforcement staff.*	*1*

how to recognise *A. gouldi* and how to obtain the evidence required for prosecution. d) An education and awareness program will encourage everyone to assist with surveillance by reporting fishing to IFS inspectors or via the Bushwatch phone number. e) A process for registering and permitting of existing mounted specimens collected legally before the ban of fishing will be developed and put in place.	d) No active community education and awareness program currently operating. However, community reports of illegal fishing are regularly received from angling club members, regional NRMs, Waterwatch and landholders. *Recommendation – activities to encourage the public to report incidents of illegal poaching should be undertaken.* e) Unknown whether a process for registering of legal specimens has been developed. There are difficulties proving provenance and owners of legal specimens may be reluctant to have their specimens tagged. Workshop participants also thought there is a lack of resourcing for this action to occur. *Recommendation – considered a low priority action.* ***New recommendations:*** • *Working with police more explicitly may be beneficial in the future as this is often necessary to ensure the safety of compliance officers. Cooperation would maximise the effectiveness of any compliance/enforcement activities and would be beneficial for both parties.* • *There should be a change in focus of compliance/enforcement activities from targeting recreational fishers to targeting poaching/illegal fishers instead.*	
1.3 Monitor awareness and compliance with the ban. Assess level of awareness and conservation support through angler questionnaires and other surveys. a) Inclusion of appropriate questions on the annual postal angler survey conducted by the IFS and standardised verbal surveys to be conducted at Agfest and IFS Open Day and DPIWs Living Treasures Week activities, etc. b) Bait line surveys to be conducted at selected previously surveyed sites (from studies above), with bait lines being counted and removed annually over a three year period.	1.3: Varied progress – actions implemented informally only *a)* No formal monitoring of awareness of the fishing bans has been undertaken. However, early informal efforts involving conducting surveys by questionnaires were not found to be effective as reliability of information provided could not be verified. *Recommendation – this action is considered low priority and should not be continued.* b) Formal monitoring and surveying of bait lines does not appear to have occurred, however informal monitoring is undertaken by enforcement officers, NRM officers and researchers. This however was not considered by workshop participants to be the best use of resources. *Recommendation – this action should not be continued.*	1
Specific Objective 2: Prevent and ameliorate habitat degradation.		

2.1 Develop and implement new and existing cooperative mechanisms and strategies for protecting habitat on private land. a) Mechanisms for protecting lobster habitat on private land will be further developed and promoted. b) Input will be made to relevant strategies, policies and programs which are planned or under development by Federal, State and local government and other organisations.	2.1: Completed, however requires ongoing maintenance a) Several stakeholders have undertaken this activity, including Land for Wildlife, Tasmanian Land Conservancy, Landcare, FPA, DPIPWE Private Land Conservation programs, NRM property management planning. The Tasmanian Landcare biodiversity fund has specifically targeted north-west landholders with information on controlling weeds and protecting riparian areas in places with *A. gouldi*. Current funding for these types of activities is limited. *Recommendation – this action should be continued, with a focus on increasing participation in the north-east.* b) This activity has been undertaken by numerous stakeholders: Conservation of Freshwater Ecosystem Values (CFEV) contains *A. gouldi* mapping; planning and policy tools have been developed for application in the forestry system; and, Cradle Coast Natural Resources Management (CCNRM) has had relevant input to the Inglis-Flowerdale Water Management Plan. Management of state and forestry land are more of an issue for this species than private land management.	3
2.2 Improve agricultural and urban management practices through development of effective habitat protection measures, communication with landowners, establishment of demonstration sites for habitat rehabilitation, and liaison with land and water management agencies. a) Communicate with land managers to improve awareness of *A. gouldi* habitat requirements, the need to avoid habitat disturbance, riparian land and watercourse rehabilitation and the benefits of this to *A. Gouldi*. b) Establish demonstration sites for *A. gouldi* habitat rehabilitation in agricultural areas. c) Liaise with water managers to ensure that requirements of *A. gouldi* are included in water management planning and environmental flow assessments.	2.2: Varied progress - some actions not implemented, come underway, some completed: a) This activity has been implemented by numerous stakeholders, including councils, NRMs, Landcare, FPA, DPIPWE, and land protection agencies during site visits. Project officers have been communicating with landholders regarding *A. gouldi* habitat requirements, best practice management and threatening processes. b) A demonstration site has not been established, however the Flowerdale catchment has been recommended as a potential demonstration catchment (as it covers a mix of private and state lands and a mix of different habitat qualities and a number of different *Astacopsis* populations with varying conservation statuses). *Recommendation – a demonstration site should be considered as part of a future recovery plan.* c) The revised Tasmanian Environmental Flows (TEFLOWS) process ensures that threatened aquatic species are considered in the water planning process. CCNRM have previously had input into the water planning process for the Inglis-Flowerdale catchment. Tasmanian Irrigation developments	**1**

	must also ensure that lobsters are considered as part of their planning and environmental management process. Targeted surveys have been undertaken in relation to irrigation developments. Nevertheless, issues have occurred previously when dams have been blocked, lobsters have died and follow-up has not occurred. There is a lack of true catchment-scale water management plans (focus has been on irrigation schemes instead) and this may need to occur. NRM regions in Tasmania do not have statutory powers in this space. *Recommendation - More work needs to be done on this in the future.*	
d) Promote the development of agricultural codes of practice that will protect and improve *A. gouldi* habitat.	d) The development of agricultural codes of practice has not occurred. The dairy industry has a voluntary code of practice in place that may have potential benefits. *Recommendation – this action is not considered a high priority. For it to be effective, codes of practice need to enforceable.*	
e) Refer in-stream developments proposed within the range of *A. gouldi* to the Australian Government for assessment and approval if and as required under the EPBC Act.	e) Large developments have been referred for assessment under the EPBC Act and have often been conditioned for threatened species management. However, it is unclear if all developments impacting on *A.gouldi* have been captured under this action.	
2.3 Implement effective habitat management in areas of forestry operations by refining and implementing management prescriptions to protect *A. gouldi* habitat, and evaluating their effectiveness.	2.3: Varied progress - some actions not implemented, some underway, some completed:	2
a) Review current management prescriptions for *A. Gouldi* to ensure they meet the requirements of this plan and update other planning tools used in the FPP planning process, and conduct training courses for forestry personnel involved.	a) Management prescriptions for *A. gouldi* were reviewed by Wapstra and Doran in 2009-2012 and procedures for the management of threatened species in areas subject to forest management under the forest practices system were developed in 2011 and approved by FPA and DPIPWE (the current planning tool is applied at a coupe by coupe level, it is not a broad strategic tool). FPA planning guidelines were revised in 2008 and the Fauna Technical Note for *A. gouldi* has been updated (FPA, 2013). FPA undertakes staff training and promotes the tools they develop for species conservation at relevant field days. The habitat suitability map has not been updated. Currently the habitat map used by foresters has three categories, 'high', 'moderate' and 'low' suitability. Under the agreed procedures, areas mapped as predicted 'high' suitability can either be considered to be accurately mapped and have a wider streamside reserve buffer applied (30 m on sections of headwater streams identified as high suitability) or they can be checked by foresters and reassessed if on-ground assessment suggests the area is of lower quality and then have the less constraining management measures applied for the lower quality habitat. Areas mapped as predicted 'moderate' suitability require on-ground assessment to confirm their condition in case they actually contain 'high' quality habitat that has not been mapped correctly. *Recommendation* –	

	training courses should continue to be provided to new personnel to show how the habitat suitability mapping and other tools are to be applied and refresher courses should be considered for ongoing personnel.	
b) Develop a strategic plan for the management and/or reservation of *A. gouldi* habitat, based on a catchment-by-catchment approach informed by habitat suitability mapping, and incorporate it in forestry planning.	b) A planning procedure which relies upon habitat suitability modelling and habitat suitability classes has been developed by the FPA; however this plan does not include specific or strategic catchment by catchment prescriptions. Coupe dispersal is recognised as an ongoing issue and therefore different buffering rules apply if harvesting on both side of streams. Upstream management of streams is recognised as another issue, particularly as it does not apply to habitat management for streams above 400 m in altitude; this means downstream effects are not being prevented in these areas resulting in potential sedimentation impacting downstream populations. Forestry activities are starting to move into areas that are not managed for *Astacopsis* as they are outside of the species habitat range (i.e. >400 m asl). Sedimentation is a huge issue for juvenile *Astacopsis* (a report soon to be published by Peter Davies supports this concern) and a method to protect habitat upstream of high suitability habitat will be critical to future recovery of the species. However, in some areas the headwater streams may be so close that standard buffers may severely impact on logging activities. *Recommendation - A strategic approach, at the catchment level, needs to be developed to capture issues related to the downstream flow of impacts. This may be best achieved by first identifying/confirming key areas (as identified in Lynch and Bluhdorn, 1997, and also outlined in the recent Timber Harvesting Agreement that was overturned after the 2013 change of government) where stricter prescriptions apply to upstream areas (e.g. classifying entire catchments as 'high' suitability habitat in areas containing key Astacopsis populations/habitat). FPA would be supportive of the process of identifying high priority catchments, based on the availability of supporting data relating to catchment choice and suitability of different management prescriptions, and classifying these as 'high' suitability habitat for Astacopsis, if this was supported by DPIPWE under the 'agreed procedures'.*	
c) Independent experts, the Scientific Advisory Committee and the Community Review Committee to review new information and management prescriptions delivered by the FPA and DPIW to protect *A. gouldi* habitat during and after forestry operations.	c) It is unknown to what level independent experts and the Technical Advisory Committee has commented on the development of planning prescriptions. Peter Davies and Alastair Richardson were consulted during the development of the FPA Technical Note, which is based on the work of Davies et al. (2005).	
d) Undertake monitoring of the implementation of management prescriptions for protection of *A. gouldi* habitat and use results to evaluate the degree of	d) Monitoring of the implementation of management prescriptions for adaptive management purposes is lacking by the majority of stakeholders. FPA undertake some monitoring, however greater effort is needed to inform future policy development and assist in the improvement of	

	compliance and develop ways to improve implementation of any new recommendations.		current policy. *Recommendation – this action should continue.*	
e)	Undertake study of the downstream impacts of forestry operations on *A. gouldi* and its habitat and the effectiveness of the Forest Practices Code and Threatened Fauna Adviser provisions in ameliorating any impacts.	e)	The FPA has made considerable investments in research regarding *A. gouldi* habitat requirements and the potential impacts of forestry operations on the species and their habitat, including assessment of juvenile lobster habitat in class 4 streams, habitat suitability modelling, characterisation of habitat, and definition of headwater stream habitat suitability for juvenile *A. gouldi*. *Recommendation – as per notes under 2.3 b) above.*	
f)	Evaluation of habitat suitability predictions from the work of Davies (and Cook 2004, et al. 2005).	f)	The work of Davies and Cook has been reviewed and built upon, however it still requires further ground-truthing to improve its robustness and applicability by forest practice officers. This work has been generally well received; however, it may need further additions to incorporate upstream issues. *Recommendation – habitat suitability predictions developed by Davies et al. would benefit from further ground-truthing and should be updated to incorporate protocols for upstream management in key areas (as identified under 2.3 b).*	
g)	Determine appropriate land management practices for streamside reserves for all stream sizes.	g)	It is unknown whether appropriate land management practices for streamside reserves for all stream sizes have been determined. This exists in the forestry sector, but may be lacking for other sectors. The Forest Practices Code ensures that appropriate riparian buffer widths are applied to Class 1-Class 3 streams. The FPA juvenile *Astacopsis* technical note also prescribed increased buffer protection on headwater streams in areas containing medium and high quality habitat. Streams in areas which fall outside of forest management e.g. agricultural areas are not currently covered by an Agricultural Code of Practice, thus streams in these areas have less protection. Riparian buffers of 50 m or the mean height of the dominant tree type are suggested in Lynch and Bluhdorn 1997. *Recommendation – a strategic approach to stream management within the range of this species should be considered*.	
h)	Determine the impacts of culverts on *A. gouldi* movement.	h)	The impacts of culverts on *A. gouldi* movement do not appear to have been determined. However, there is work in progress to investigate this; early conclusions seem to suggest that upside-down box culverts may be the most effective for allowing movement of *Astacopsis* and reducing scouring. TFA recommends a box culvert be used for areas known to support *Astacopsis*. *Recommendation – information on the culvert designs that are most effective for allowing movement of Astacopsis should be synthesised and disseminated as appropriate.*	
i)	Determine the impacts of forest harvesting, regrowth and plantation development on water yields in catchments	i)	Research to better understand the impacts of forest harvesting, regrowth and plantation development etc. on water yields is difficult to achieve and does not appear to have been	

above high suitability habitat.	undertaken. Forestry Tasmania had a hydrologist looking at the effects of water use in relation to plantations only, however no progress was made on following up or implementing the findings or linking this research to FPA. NRMs are interested in this space (particularly NRM north, however their interest is predominantly related to sedimentation in the Tamar where *Astacopsis* does not exist). Conducting robust modelling to assess the impacts of water yields would be expensive and a significant undertaking would be required to get any useful information. *Recommendation – this would not be considered a high priority action in any future recovery plan.*	
Specific Objective 3: Monitor and assess *A. gouldi* populations and habitats.		
3.1 Conduct a population and habitat survey to obtain baseline data for detecting trends.	3.1: Completed Surveys of *A. gouldi* across northern Tasmania (including the Flowerdale, Duck, Dip and Frankland Catchments) have been undertaken by Todd Walsh supported by CCNRM investment, and also self-funding. A database to track survey results and growth data has been established. Surveys were undertaken up to 15 times per year for the first 3 years after the plans endorsement and then preceded to be undertaken intermittently until as recently as 2013. DPIPWE also undertook survey work in 2008, aimed at developing a standardised survey protocol and Jo Lyall undertook some habitat and population monitoring as part of her Honours degree in 2001. FPA currently has a student conducting population density surveys and looking at habitat suitability. However, there is no longer any regular monitoring occurring. Walsh has published life history of growth rates. Conclusions – growth and moulting may be slower and less regular than previously thought and the species life expectancy may extend up to 45. *Recommendation – regular monitoring should be a focus of future recovery efforts. There are >500 animals already tagged and these would provide a very useful basis for increasing our understanding of population trends if regular monitoring were to continue in the future (an extra decade of monitoring would be required to determine maximum age and size classes).*	3
3.2 Establish and maintain a database for population, habitat and distributional data.	3.2: Completed, however requires ongoing maintenance and updating Todd Walsh established and maintained a database to house the population data collected during his monitoring studies (this information is sent yearly to the DPIPWE threatened species section). DPIPWE also compiled a GIS database of lobster records which identified stream sections likely to support lobster habitat. Mr Walsh's data has been captured in the Tasmanian Natural Values Atlas (NVA) database. *Recommendation – NVA and Protected Matters Search Tool (PMST) databases should be maintained and updated on a regular basis.*	2

3.3 Identify and document key areas for protection using population survey data and an analysis of reservation status, needs and gaps.	3.3 Completed Identification of priority *Astacopsis* habitats recommended for protection has been completed by Todd Walsh on various occasions, based on survey and catchment data. FPA also engaged Peter Davies to investigate headwater stream habitat characteristics and juvenile distribution. The DPIPWE reserve status analysis described above may also be used to inform the selection of priority areas for species management. Mr Walsh will share the outcomes of this with DotE. *Recommendation – information on the priority habitats identified for Astacopsis should be synthesized and disseminated to relevant stakeholders (this should also feed into the implementation of the recommendation under action 2.3 b).*	3
Specific Objective 4: Increase understanding of *A. gouldi* biology and conservation requirements to improve management.		
4.1 Facilitate and coordinate selected research projects to support conservation management of *A. gouldi*.	4.1: Completed DPIPWE have invested in some research activity but typically provide support to research being undertaken by other parties. FPA have undertaken research projects directly related to *A. gouldi*, including: definition of habitat characteristics and relative abundance of juveniles; mapping suitability of *A. gouldi* habitat; investigation of the impact of forest harvesting on headwaters; downstream impacts of forestry operations on biota including Lobster habitat; and defining headwater stream habitat suitability for juvenile Lobsters.	3
4.2 Apply the results to improve species management, through Forest Practices Code provisions, management prescriptions, Water Management Plans and advice to landowners, etc.	4.2: Ongoing Research and species monitoring results have been used to improve species management, particularly the forest practices code and prescriptions. Species habitat assessment protocols are now being used by Tasmanian Irrigation and others to ensure adequate consideration is given to protecting the species during significant regional developments. Habitat mapping and modelling forms the basis to species management and the implementation of management prescriptions and policy adoption. The TEFLOWS process used in water management planning has also evolved to ensure environmental water requirements of threatened species are also acknowledged and provisioned for in estimating sustainable diversion limits. Research results have been used to relate best practice management information to landholders. *Recommendation – while there has been significant progress on this action there is still further work needed. The research that is currently underway, and the work to be published shortly by Peter Davies, should be incorporated into future updates of management practices. There is also a need to review what research has and has not been incorporated into management practices thus far and to identify which gaps still need to be addressed.*	2

Specific Objective 5: Coordinate implementation of the recovery program.		
5.1 Coordinate recovery plan actions, reporting and funding to achieve the Recovery Plan objectives.	5.1: Partially completed A project officer has not been employed specifically to oversee recovery plan implementation. DPIPWE received funding to coordinate the implementation of the Recovery Plan actions under National Heritage Trust grants in 2006/2007. Some of these actions were undertaken in house and others were outsourced to regional NRMs and other groups (redistribution of funding). DPIPWE also established and coordinated a technical advisory committee to oversee Recovery Plan implementation. CCNRM has also invested > $480k in *A. gouldi* recovery actions since 2006.	1/2

1.2: Additional actions undertaken -

Action	Modified/New	Link to any specific objectives	Rationale for inclusion and implementation details
Actions			
1 AusRivers work	New	Mechanisms to address habitat degradation	Surveys/assessments of river health were conducted as a part of the AusRivers project. This work could be linked to habitat assessments as it takes into account the health of biota within rivers. There is some disagreement as to whether AusRivers river health ratings are appropriate for drawing conclusions on *Astacopsis* habitat suitability and health; however they are the most effective method currently available for assessing the health of in-stream biota.

1.3 Discussion *Most actions were at least partially implemented, though there was varying levels of success in regards to the effectiveness of actions. The appropriateness of certain actions to Astacopsis conservation was also questioned.*

Actions relating to the 'reduction and elimination of fishing pressure' have been partially implemented. There has been a noticeable reduction in pressure from recreational fishers; however the fishing ban came into place before the recovery plan was made. The recovery plan has had a limited effect in increasing awareness about the ban and poachers may still be targeting the species. Enforcement activities have been limited and should be a greater focus of a new recovery plan, with joint enforcement between compliance officers and police focussing on illegal poaching. Overall this objective should be more streamlined and targeted in the future, with unnecessary actions removed.

Actions relating to 'prevention and amelioration of habitat degradation' have been partially implemented. Mechanisms to protect habitat on private land were successfully developed and implemented in the north-west, however future recovery efforts would benefit from implementing similar protections in the north-east. A demonstration catchment showing best practice management for agricultural and urban management was not established, this should be a focus in any future recovery plan. While forestry operations have been significantly improved in relation to lobster conservation there is a need to address the impacts of upstream clearing on downstream lobster populations, as increased sedimentation arising from clearing in headwaters appears to be a key threat to juvenile lobsters.

Population and habitat monitoring actions were completed, a database was established and key areas for the species were identified. The average size of lobsters being recorded has increased since the fishing ban was implemented. Ongoing monitoring needs to continue to determine whether some populations are starting to recover and the database needs to be updated as new survey information is gathered so that population trends can be assessed. Information on key habitats needs to be synthesized and incorporated into habitat management practices for forestry operations.

Numerous research projects were completed and have improved knowledge of the lobsters and their habitat. However, there are still knowledge gaps to identify, particularly in relation to optimal streamside buffers in headwaters to reduce downstream sediment flows. Furthermore, a review needs to be conducted to ensure that research findings have been incorporated into management practices.

Funding limitations, changes in staffing and other resource constraints limited the overall effectiveness in the implementation of recovery plan actions.

2.0: EVALUATION AGAINST OBJECTIVES

Overall recovery plan objective:

2.1: Summary evaluation of achievement against specific objectives

*Status progress: 0 = Cannot be assessed (criteria not measurable or actions not implemented) = **achievement of objective can't be assessed**
1= No progress towards meeting criteria = **objective not achieved**
2 = Criteria not met but some progress = **objective partly achieved**
3 = Criteria met = **objective achieved**

Specific objectives/recovery criteria	Status progress	Comments
SO1: Reduce and eliminate fishing pressure.		
1.1 Fishing pressure on *A. gouldi* has been eliminated or reduced to a low level that is no longer considered a threat to population density or structure across its former range.	2	1.1. Successful in terms of scale of impacts. Reductions in recreational fishing have been significant. Nevertheless, fishing is still an issue in terms of small numbers of people engaged in significant poaching activity that may have a large impact. Fishing bans have been very effective for the species' recovery and need to be maintained, even if the species conservation trajectory were to improve significantly.
1.2 A community education and awareness program is continuing. A high level of community awareness of *A. gouldi* management issues and support for conservation has been demonstrated.	2/1	1.2. Community education and awareness was very effective in the early days of recovery plan implementation but has stalled due to a lack of funding.

SO2: Prevent and ameliorate habitat degradation.		
2.1 Areas of private land are being protected for *A. gouldi* conservation under cooperative mechanisms.	2	2.1. There was good uptake in terms of private landholder interest in identification of the species on their lands and mechanisms to protect the species. Voluntary programs have been very successful. Some covenants have been enacted, though more funding would be beneficial to continue this initiative.
2.2 Effective habitat protection and rehabilitation measures have been developed and implemented for agricultural, forestry and other potentially damaging activities.	1-2	2.2. There have been effective mechanisms developed for forestry, though there is still scope to incorporate future research into ongoing forestry management (e.g. headwater stream protection). Mechanisms have been slower to improve in other sectors/tenures such as dam constructions and agriculture, for example. There have been fundamental changes made to the assessment of dam construction in Tasmania; the formal committee conducts assessments have been abolished and a self-regulatory approach has been put in place. Assessment mechanisms are very important. There is a need to ensure user uptake of new referral guidelines, when finalised.
2.3 Protection of key areas (see Objective 3) has been progressed through available mechanisms such as private land covenants, public land reserves, regional NRM strategies.	2	2.3. Many covenants have been entered into (particularly in north-west, though many are small), however funding constraints may have limited total potential uptake. Some regional NRMs have strong engagement and strategies for *Astacopsis* but have limited powers in many situations. Public land reserves have not been set aside for this species. *Protection of upland headwater regions still a priority.*
2.4 A community education and awareness program is continuing. A high level of community awareness of *A. gouldi* management issues and support for conservation has been demonstrated.	2	2.4. Community awareness programs were very effective in the early days of the plan, however due to funding restrictions, the scope and programs were limited. Public interest and participation was very strong and there is still potential for future engagement.
SO3: Monitor and assess *A. gouldi* populations and habitats		
3.1 A survey of population abundance, recruitment, size structure, sex ratio and habitat characteristics has been conducted at a stratified set of sites using standardised methods.	2/1	3.1 Good baseline monitoring was conducted, and regularly occurring, when the plan was implemented. However funding restraints limited ongoing monitoring efforts. *New genetic techniques could help reduce knowledge gaps in the future. Surveying needs to occur at a greater range of sites with a greater variety of representative habitat qualities (most sites that are currently surveyed are the ones that are known to be in good condition).*
3.2 The surveys are incorporated into monitoring programs so that they are repeated every 5 years.	1	3.2 Limited funding has restricted frequency of monitoring efforts.
3.3 Monitored populations do not further decline and show recovery, measured in the short term by maintenance or increase in the populations'	1/2	3.3 An increase in the size of adults has been documented. This is suggestive of a recovery, as animals are presumably living longer on average. More surveys need to

size range and numbers, and successful recruitment. **3.4** A comprehensive database has been established and is maintained on *A. gouldi* population abundance, recruitment, structure, habitat condition and distribution, to enable detection of trends. **3.5** Key areas requiring protection have been identified and documented.	 2/3 3	be conducted in order to determine whether the numbers have increased. IFS have documented that two trans-located populations are still remaining (adults and juveniles recently documented). *Some populations may be stable, but more information is needed to determine whether overall numbers have remained stable, increased or decreased. Marginal areas need to be surveyed (only a few good quality sites are monitored and understood).* 3.4 A database has been established and information is fed into DPIPWEs Natural Values Atlas (NVA) database on a regular basis. 3.5 Key areas requiring protection have been identified on multiple occasions. *This information needs to be incorporated into future management and recovery efforts.*
SO4: Increase understanding of *A. gouldi* biology and conservation requirements to improve management.		
4.1 Knowledge gaps have been addressed in the areas of adult and juvenile movement, environmental flow requirements, efficacy of Forest Practices Code provisions for *A. gouldi* population protection, and genetic relationships between populations. **4.2** The information is applied in species management e.g. through Forest Practices Code provisions, management prescriptions, Water Management Plans and advice to landowners.	2 2	4.1 Some knowledge of movement has been gained but further genetic studies will be useful in the future to understand the relationships between populations and the meta-population movements. Some work has been done on environmental flows and the basics are understood, but there is poor knowledge of the impacts of the number of dams being constructed and research needs to be done on the impacts of these to environmental flows and water temperature. *The forest code has been improved but more work needs to be done to assess the adequacy of current buffers and mechanisms for protecting upstream habitats*. 4.2 Some early research has been incorporated into current practices (especially for forestry). However, research is still continuing and there will be an ongoing need to incorporate findings of new research into future management practices.

SO5: Coordinate implementation of recovery plan.		
5.1 The recovery program is effectively and efficiently implemented through coordination of actions and reporting.	1	5.1 Recovery plan implementation has been progressing but limited, primarily due to funding constraints. Implementation and financing of some actions was largely undertaken by Cradle Coast NRM. DPIPWE has undertaken actions relating to covenants and policy work. FPA has contributed to research projects.

2.2 Discussion of achievement of recovery plan objectives

The recovery plan has gone a long way towards implementing, and progressing towards achieving the objectives, however there are significant gaps.

Fishing pressure has been significantly reduced in terms of recreational fishers, though this may be more related to the fishing ban then the recovery plan itself and targeted poaching may be occurring. Habitat degradation issues have improved to some degree in certain sectors, with forestry practices, in particular, having greatly improved and private landholders showing an interest in lobster conservation. Activities to raise community awareness were effective; however gaps remain in relation to other sectors, such as the agricultural sector. This may be improved by the provision of information on best practice management for the species' conservation. Early monitoring and assessment of the species was very effective and led to significant improvements in knowledge of the species ecology and distribution. A number of research projects were undertaken and the findings have been, to various degrees, incorporated into land management practices. Recovery plan implementation has been progressing but limited, primarily due to funding constraints.

Overall, while some recovery actions were completed, and many more partially implemented, the objectives of the plan have not been fully realised. Future recovery actions should focus on: joint enforcement between compliance officers and police to target poachers and act as a deterrent to other poachers; the development of mechanisms to protect upstream habitats and reduce sedimentation impacts on downstream lobster populations; implementation of reserves, or other mechanisms such as conservation covenants, to protect key habitat; regular, ongoing monitoring of a range of sites of varying habitat quality to assess population trends and response to management actions; further research on the species including, genetic studies, investigation of the impacts of water flow and temperature, and the adequacy of current streamside buffers; and, incorporation of research findings into management practices.

Overall, there were many actions in the recovery plan, and not all of these actions would constitute an appropriate use of resources. Any future recovery plan would benefit from taking a more streamlined and targeted approach. Future recovery efforts should focus on identifying key actions that could make a significant contribution to the conservation of the species, such as: the identifying key habitat that may benefit from greater protection or reserve status; extra protection, in terms of forestry practices, for habitat upstream of key lobster populations; a shift in fisheries compliance activities to focus on illegal poaching, including greater collaboration with police; and, a continuation of the effective community engagement activities, including promoting the lobster as a flagship species.

3.0: CHANGES IN KNOWLEDGE AND CONSERVATION TRAJECTORY

3.1: Evaluation of the current status and conservation trajectory of the species

Previously known status at the time the recovery plan was published	
Habitat/distribution	At the time the recovery plan was published *Astacopsis gouldi* had a limited extent of occurrence, based on the IUCN criteria and was experiencing reductions in extent of occurrence and the area and quality of habitat. Its range extended from the Arthur River, in Tasmania's north-west, across the north of the state to the Ringarooma River, including the Arthur River catchment and all river catchments flowing into Bass Strait, with the exception of the Tamar catchment. In addition, the species had been introduced to two catchments: the North Esk catchment (St Patricks River) and the Derwent catchment (Clyde River).
Abundance	At the time the recovery plan was published *Astacopsis gouldi* was predicted to be experiencing population declines, based on the number of subpopulations and number of mature individuals.
Threats	At the time the recovery plan was published the principal threatening processes affecting *A. gouldi* were past legal and now currently illegal fishing pressure, and habitat disturbance.
Trajectory predicted	At the time the recovery plan was published consistent information on population status was not available across the lobster's range. However, available information indicated that populations in several catchments had experienced major declines due to the main threatening processes.

Current known status	
Habitat/distribution	The present distribution of the species is disjunct, with some localised extinctions or population declines in a number of catchments within the original range. *Astacopsis gouldi* could be considered Endangered in the north east range of the species. Surveys in all major catchments in 2009/2010 (Walsh) showed that massive sediment loads had decimated the population in most downstream areas of the catchments. Probable localised extinctions are possible in the Little Forester, Brid, Great Forester, Tomahawk, Boobyalla, Ringarooma and Great Musselroe. There have been major declines in some north west catchments (Rubicon, Mersey, Duck, Montagu and Welcome).The north west continues to support the greatest majority of *A. gouldi*. Historically, the species was introduced into the North Esk and Derwent River (River Clyde) catchments, both introductions appear to have been successful (Rob Freeman, IFS, pers. comm.). Juvenile *A. gouldi* habitat definitions have been refined (Davies and Cook 2005).
Abundance	Since regular surveying began in 1998, the average size and maximum size of captured crayfish has increased (Walsh & Walsh 2013). *Astacopsis gouldi* is quite abundant in parts of the following catchments: Arthur, Black-Detention, Inglis, Cam, Emu, Blythe, Leven and Forth-Wilmot. The major remaining stronghold of the species for both habitat and population density would be the Arthur, Frankland, Black, Dip, Flowerdale and Leven Rivers. While some population monitoring has been conducted, to date there has been no clear determination of the overall population status/abundance.
Threats	Ongoing threats include forestry, illegal fishing and declining water quality (mainly sedimentation), habitat disturbance with particular reference to sedimentation is by far the greatest threat. Water management including the construction of large irrigation dams causing changes to stream flows have also raised concern, particularly in the north east of the State. Longer-term, it is considered likely that climate change will negatively impact the species by alterations to stream flows resulting from altered precipitation events. While reduced, illegal fishing continues and enforcement remains an issue.
Trajectory predicted	Given the slow growth rate of the crayfish, it is only recently that the benefits are evident of reducing widespread fishing pressure on the species. There has been observable improvement in the overall size of mature individuals; larger specimens are now being recorded with increasing regularity as part of ongoing monitoring, with 4 kg animals being found. While these animals are still of notable size compared to the average, it is particularly significant that they include marked/tagged specimens that had first been captured at smaller sizes in the preceding years. This indicates that the larger specimens will become more common as recovering populations continue to mature. It should be noted that the apparent increase in size of recorded specimens is based on preliminary indications from ongoing monitoring. These trends need to continue to be documented to better quantify this change into the future. There remain concerns for the populations in the north-east of the State, where sections in only two out of the seven catchments support good populations of the species. Overall, it is likely that the population is increasing and stabilising in those catchments with suitable habitats. However, populations have remained extremely low in those catchments with heavily degraded habitats. There is an anomaly in the north east, where there appears to be area of excellent habitat that may have suffered major population declines due to water quality issues caused by historical mining. The water quality may have improved, but the populations have not demonstrably recovered.
Evaluation of change in conservation trajectory	
It appears likely that overall, the population of *A. gouldi* is slowly recovering, particularly in the north-west of the State. Preliminary indications from the north-east of the State are that the populations in that region are severely fragmented and impacted (Doran et al 2008).	

3.2 Discussion of recovery plan contribution to change in status

The recovery plan for *A. gouldi* has been a successful driver for directing research on the species. And surveys funded by Cradle Coast NRM have provided the most comprehensive data to date for this species. However, knowledge gaps still remain in relation to recruitment success and speed of recovery for the species, and north-east Tasmania needs to be surveyed to locate any potential pockets of remaining populations. Furthermore, the north-east population is recovering as well as the north-west population which has many stable subpopulations and areas of healthy habitat. Overall, there have been no demonstrated increases in the species extent/range and the majority of threats outlined in the recovery plan are still operating.

The greatest influence on the possible recovery of this species thus far has been the ban on fishing, which predated the implementation of the recovery plan. This action must continue to ensure ongoing recovery of the species. Forestry operations have improved in recent years, though it is unclear how much this can be directly attributed to the recovery plan. Nevertheless, there is still room for further improvement of forestry management practices, particularly in headwaters upstream of important lobster populations. While fishing pressure resulting from recreational fishers has been reduced and forestry practices have improved, other recognised threats to the species are unlikely to have changed significantly and new threats may yet arise. Currently, sedimentation is the most significant threat the species faces, however this can be altered dramatically, or even reversed, with proper management. Climate change is suspected to negatively impact the species but the extent of the current or potential future impact to the species is as yet unknown.

Given the gaps in information identified above it is difficult to determine the overall conservation status of *Astacopsis gouldi* and whether any true recovery may have occurred. The species is currently listed as vulnerable on both the TSP and EPBC Acts. However, a formal review of the species status will be undertaken as part of the alignment of the lists of threatened species under the TSP and EPBC Acts. This process may reveal further information about the current conservation status of the species, and enable assessment of whether the recovery plan has contributed to any potential change in conservation status.

4.0: RECOMMENDATIONS

4.1: Potential future recovery objectives/actions.

Objective/action	Existing, Modified, New	Link to any existing or new objectives	Comments
Reprint fact sheet, colour brochure, posters and stickers, and develop new materials	Existing	1.1 b)	IFS has a brochure that could be updated and reprinted. More information is available on the internet (e.g. DPIPWE have an online fact sheet). The previous 'Care for the Lobster' poster was very popular with schools.
Add lobster information to the IFS website and link to other relevant sites	Existing	1.1 d)	The IFS website could benefit from updating the information on *A. gouldi* and adding links to other information sources, such as the DPIPWE fact sheet.
Provide informative material to agricultural industries	Existing	1.1 g)	There are opportunities available to do more work with agricultural communities to improve the conservation status of *A. gouldi.*

Run presentations at field days and Forest Practices Officer courses	Existing	1.1 h)	Current practices should continue.
Promote lobsters as a flagship species for good catchment management	Existing	1.1 i)	This action should continue, with particular attention given to improving work to promote the species in the north-east.
IFS to lead routine, high-profile enforcement effort including surveillance, apprehension and charging of offenders and prevention of illegal trade	Existing	1.2 a)	Enforcement of the fishing ban is still needed for this species, particularly in the north-west. While illegal fishing is likely to have decreased significantly the actions of a few professional poachers can still have significant consequences. Enforcement activities would also benefit from joint cooperation between staff from Parks, DPIPWE, IFS and the police force. Well targeted enforcement activities may act as a deterrent to other potential poachers.
Reprint and distribute an existing brochure for IFS and PWS enforcement staff and Tasmania Police showing how to recognise *A. gouldi* and obtain evidence required for prosecution	Existing	1.2 c)	Material should be updated, reprinted and provided to enforcement staff. In conjunction, publicising the good news story that we are seeing larger lobsters appear 15 years after the fishing ban and a reminder that if enforcement remains important.
An education and awareness program will encourage everyone to assist with surveillance by reporting fishing to IFS inspectors or via Bushwatch phone number	Existing	1.2 d)	Activities to encourage the public to report incidents of illegal poaching should continue.
Working with police more explicitly on compliance activities	**New**	Objective 1	Working with police more explicitly may be beneficial in the future as this is often necessary to ensure the safety of compliance officers. Cooperation would maximise the effectiveness of any compliance activities and benefit for both parties.
Focus on targeting poachers	**New**	Objective 1	There should be a change in focus of compliance/enforcement activities from targeting recreational fisheries to targeting the poaching/illegal fisheries.
Mechanisms for protecting lobster habitat on private land will be further developed and promoted	Existing	2.1 a)	This action could be renewed with further funding and a focus on increasing participation in the north-east.
Assess the effectiveness of conservation covenants	**New**	Objective 2	Several conservation covenants have been entered into to protect *Astacopsis gouldi* and its habitat. There is a need to better understand the effectiveness of these covenants, including monitoring to ensure landholders are complying with the terms of their covenant over long time frames.
Establish demonstration sites for *A. gouldi* habitat rehabilitation in agricultural areas	Existing	2.2 b)	A demonstration catchment should be established. The most likely sites would be in the Flowerdale catchment or the Duck Catchment.
Liaise with water managers to ensure that	Existing	2.2 c)	Important work that should be continued into future recovery plans.

requirements of *A. gouldi* are included in water management planning and environmental flow assessments			
Conduct training courses for forestry personnel involved.	Existing	2.3 a)	Training courses should be provided to new personnel to show how the habitat suitability mapping and other tools are to be applied and refresher courses should be considered for ongoing personnel.
Develop a strategic plan for the management and/or reservation of *A. gouldi* habitat, based on a catchment-by-catchment approach informed by habitat suitability mapping, and incorporate it in forestry planning.	Existing	2.3 b)	A strategic approach, at the catchment level, needs to be developed to capture issues related to flow of impacts from upstream to downstream. This may be best achieved by first identifying/confirming key areas (as was done in the recent Forest Agreement that was overturned after the 2013 change of government) where stricter prescriptions would apply to upstream areas (e.g. classify entire catchments as 'high' suitability habitat in areas containing key *Astacopsis* populations/habitat). DPIPWE and FPA could work together to refine streamside buffer classifications in areas upstream of 'high' suitability lobster habitat.
Undertake monitoring of the implementation of management prescriptions for protection of *A. gouldi* habitat and use results to evaluate the degree of compliance and develop ways to improve implementation of any new recommendations	Existing	2.3 d)	This action should continue and feed back into action 2.3 b) in an adaptive management process.
Evaluation of habitat suitability predictions from the work of Davies (and Cook 2004, et al. 2005)	Existing	2.3 f)	Habitat suitability predictions would benefit from further ground-truthing and should be updated to incorporate protocols for upstream management in key areas (as identified under 2.3 b).
Determine the impacts of culverts on *A. gouldi* movement	Existing	2.3 h)	Information on the culvert designs that are most effective for allowing movement of *Astacopsis* should be synthesised and disseminated as appropriate.
Increase forestry streamside protections in key upstream habitats	**New**	Objective 2	Consider extending class 4 stream protections to 50 m in whole catchments upstream of key areas identified for *A. gouldi* (under FPA). *This is the key action needed to secure A. gouldi populations and is considered vital to the success of any future recovery plan.*
Increase the total area of reserves	**New**	Objective 2	Consider protecting key areas/reserves in pristine high quality catchments supporting healthy lobster populations (Todd Walsh identified that protection of approximately 30,000 ha of key habitat would result in significant conservation wins for the species). *If this action was achieved it may greatly reduce the need for any active management of the species in the future.*

Continue monitoring of long term study sites for determining reproductive ecology and habitat use of recovering local populations.	Existing	3.1	Regular monitoring of study populations should be a focus of future recovery efforts to determine age, moult, reproduction and growth dynamics, and to increase understanding of how fast the species can recover, as well as its behaviour and ecological roles, in an un-fished population. There are >500 animals already tagged and these would provide a very useful basis for increasing the understanding of local population dynamics if regular monitoring were to continue in the future (an extra decade of monitoring would be required to determine maximum age and size classes).
Establish and maintain a database for population, habitat and distributional data	Existing	3.2	NVA and PMST databases should be maintained and updated on a regular basis.
Identify and document key areas for protection using population survey data and an analysis of reservation status, needs and gaps	Existing	3.3	Information on the priority habitats identified for *Astacopsis* should be synthesized and disseminated to relevant stakeholders (this should also feed into the implementation of the recommendation under action 2.3 b).
Increase understanding of genetic connectivity and determine effective population estimates	**New**	Objective 3 (3.1)	Undertake genomic research to assess population structure and genetic relationships within and between populations, and increase understanding of movements within the meta-population. Analyse results to estimate population size and survivorship of young. Follows on from the work conducted under action 3.1 and where possible, should link to ongoing surveys of tagged individuals.
Apply the results to improve species management, through Forest Practices Code provisions, management prescriptions, Water Management Plans and advice to landowners, etc.	Existing	4.2	While there has been significant progress on this action there is still further work needed. The research that is currently underway, and the work to be published shortly by Peter Davies, should be incorporated into future updates of management practices. There is also a need to review what research has and has not been incorporated into management practices thus far and to identify which gaps still need to be addressed.
Reintroductions, translocations and re-wilding	**New**	Objectives 3 and 4 would inform this action	Consider reintroductions, translocations and re-wilding of lobsters into areas where previous habitat impacts have been removed. (the University of Tasmania (UTAS) has previously bred the species and thus has the potential to assist this work – this may be related to studies in feasibility of aquaculture and the genetic characteristics of (meta) populations).
Adaptive management	**New**	All objectives	A new recovery plan would benefit greatly from inclusion of a key overarching principal of adaptive management to identify new threats and refocus priorities appropriately, including the ability to recognise when certain actions are no longer relevant.

4.2 Discussion and recommendation for future recovery effort

Workshop participants were in agreement that a new recovery plan should be developed for the species. While it was acknowledged that a considerable progress had been made on implementing the 2006-2010 Recovery Plan it was also agreed that continued efforts were required to secure the future of the species. Participants agreed that the new plan should be more targeted and that the focus should be on building upon the actions already undertaken and identifying the actions that would be likely to be the most effective in improving the species conservation status. It was also agreed that adaptive management should be a key component of the new plan to allow an iterative approach to implementation that could be informed by emerging knowledge and research findings. Some key features of the new plan would be to consider potential mechanisms for increasing protections in key habitats, addressing the issue of upstream land management activities that impact on key downstream habitats and shifting the focus of fisheries compliance to tackling poaching. The new recovery plan should be designed to incorporate lessons learnt from the species prioritisation work, conducted by DPIPWE in 2009, which identified species monitoring, the creation of reserves and compliance activities as the three actions that would be most likely to secure the species for 50 years into the future.

5.0: INFORMATION SOURCES, REFERENCE MATERIAL, ACKNOWLEDGEMENTS:

Davies PE and Cook LSJ (2004). Juvenile *Astacopsis gouldi* in headwater streams – relative abundance and habitat. Report to the Forest Practices Board (April 2004). 42 pages. Freshwater Systems (Aquatic Environmental Consulting Service) Tasmania, Australia.

Department of Primary Industries, Parks, Water and Environment (Tas) (2009). Prioritisation of threatened flora and fauna recovery actions for the Tasmanian NRM regions. Department of Primary Industries, Parks, Water and Environment: Hobart, Tasmania.

Forest Practices Authority 2013, 'Assessing giant freshwater crayfish habitat in class 4 streams', *Fauna Technical Note No. 3,* Forest Practices Authority, Hobart.

Hamr P (1990). Comparative reproductive biology of the Tasmanian freshwater crayfishes *Astacopsis gouldi* (Clark), *Astacopsis franklinii* (Clark), and *Parastacoides tasmanicus* (Clark) (Decapoda; Parastacidae). PhD Thesis. School of Zoology. University of Tasmania, Hobart, Tasmania, Australia.

Hamr P (1996). A giant's tale: the life history of *Astacopsis gouldi* (Decapoda: Parastacidae) a freshwater crayfish from Tasmania. *Freshwater Crayfish* 11:13–33.

Hamr P (2008). The life history of the crayfish *Astacopsis franklinii* (Parastacidae) in streams on Mount Wellington, Tasmania. *Freshwater Crayfish* 16:155–164.

Horwitz P (1991). On the distribution and exploitation of the Tasmanian giant freshwater lobster, *Astacopsis gouldi* Clark. 26 pages. A report to the Tasmanian Office of the National Estate. Hobart, Tasmania, Australia.

Lynch TP and Bluhdorn DR (1997). Reservation assessment and habitat requirements of the giant Tasmanian freshwater lobster, *Astacopsis gouldi*. 74 pages. Report to the Tasmanian RFA, Environment and Heritage Technical Committee. Hobart, Tasmania, Australia.

Walsh TS and Walsh BB (2013). A Study of Growth and Moulting Rates of *Astacopsis gouldi* Clark. *Freshwater Crayfish* 19(1): 97–101.

Attachment A

List of workshop attendees

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