Review of recovery plan for four species of handfish (2005)*

Spotted Handfish – Brachionichthys hirsutus Red Handfish – Brachionichthys politus Ziebell's Handfish – Sympterichthys sp. Waterfall Bay Handfish – Sympterichthys sp.

* Note: Red handfish has now been renamed as *Thymichthys politus* and Ziebell's and Waterfall Bay handfish have been re-classified as a single species under the name *Brachiopsilus ziebelli*.

INTRODUCTION

This document reviews the Handfish Recovery Plan (2005). In particular, it looks at the implementation of recovery actions and progress in meeting plan objectives and in recovery of the species. The review also aims to document the current state of the listed handfish, their conservation trajectory, and any change in management actions or priorities necessary for their recovery.

The review was populated during a workshop of managers and experts.

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 main components, as follows:

- 1.0: PROGRESS IN IMPLEMENTING RECOVERY ACTIONS
- 2.0: EVALUATION AGAINST RECOVERY PLAN OBJECTIVES
- 3.0: CHANGES IN CONSERVATION TRAJECTORY
- 4.0: RECOMMENDATIONS FOR FUTURE ACTION

Review conducted by: Ashley Leedman and panel of experts (see end of document for names of participants)

Date: October 2013

1.0: PROGRESS IN IMPLEMENTING RECOVERY ACTIONS

Table 1.1: Review of recovery actions.

Recovery Action		Implementation details	 Status	
 Monitor the population determine population undertaking scientifi robust and repeatab population surveys. 	lations and on size and change, by fically ble	 Spotted Handfish There has been ongoing monitoring of spotted handfish at five sites on the Derwent Estuary. Based on the data obtained, there is evidence that one site has remained stable while the others have experienced fluctuations, but have generally declined since 2005. There are currently only nine sites in Tasmania where spotted handfish is thought to occur, and all of these sites are in the Lower Derwent Estuary. Since the mid 1990s, there have been surveys for spotted handfish conducted at 10 sites in south-east Tasmania. Of these sites, there is enough repeat survey data to provide an indication of population change for five sites. These sites are Battery Point, Opossum Bay, Sandy Bay, Ralphs Bay and Bellerive. These sites have all shown continued use by spotted handfish up to at least 2012. The most recent set of surveys found densities at Battery Point increased between 2006 and 2011, remained stable between the 2011 and 2012 and then declined again to the levels found in 2006; the Opossum Bay population remained stable – but at low levels - since the first surveys were undertaken in 1998; the Sandy Bay population peaked in 2011 but showed significant declines in 2012 and 2013; the Ralphs Bay population declined steadily between 2005 and 2013; and the Bellerive population showed a decline between the 2005 survey and the 2013 survey (Green et al. 2012, DEP status report 2013). An additional site – Half-moon Bay – was surveyed repeatedly between 1998 and 2005 and was shown to have a steady population of handfish, but this site has not been re-surveyed since. Three sites on the Derwent Estuary were surveyed on a single occasion in 2006-2007 and were found to contain handfish – these sites were at Howrah, Tranmere, Gellibrand Point (Mary-Anne Point) (Green 2007). These sites have not been surveyed in 2008 and no handfish were located, Green 2008). Scallop monitoring dives in the D'Entrecasteaux Channel by TAFI from 2005-2007 also did not observe any	Spotted – some progress	

Red Handfish

There is insufficient survey data to determine population trends for red handfish but, considering it was once known from several locations and now appears to be restricted to a single site, it is has likely continued to decline both in abundance and distribution.

- The Primrose Sands population of red handfish is the only currently confirmed red handfish colony. The red handfish was found in Primrose bay earlier than 1997, could not be found between 2005 and 2010 and was located again in 2011 but at very low densities (SEWPAC 2012b).
- Previously, colonies of red handfish were reported from the Port Arthur region and from a number of other regions. However, there have been no reports of the existence of this species in areas outside of the Primrose Sands population in recent times (SEWPAC 2012b).
- Quantitative surveying for red handfish is logistically difficult with no resources available even for spatially based presence/absence surveys apart from a single opportunity in 2005. It is unlikely the species would be encountered opportunistically and since 2005 there have been no systematic surveys of regions outside of Primrose Sands. At this single tiny site the monitoring work has been done by volunteer marine scientists and naturalists on an ad-hoc basis. The most reliable way to detect the presence of this species is to find the egg masses by searching during the breeding season in spring.
- The red handfish was recently re-assessed under the EPBC Act and moved from the vulnerable category to the critically endangered category (SEWPAC 2012b).

Ziebell's Handfish

• The Ziebell's handfish has been observed extremely rarely and no observations have been reported for a number of years. However, there have not been any recent dedicated surveys for this species as survey work is logistically difficult and resources have not been available. It is also unlikely that recreational divers would detect them unless they were specifically looking for them. Like the red handfish, spatial presence/absence surveys for Ziebell's handfish would be best conducted during the breeding season in the spring when the female guards the eggs. There is insufficient survey data to determine population trends for Ziebell's handfish.

•••
Ä
A -
(**)
N 7
TO .
_
\sim
- I -
1
1
– D
- no
- not
– not
- not
– not c
– not co
– not co
– not cor
– not com
- not com
 not comp
 not comp
 not completion
 not comple
– not complet
 not complete
 not complete
 not completed
 not completed

Spotted – some progress

Identify important habitat areas and assess their quality, and ensure they are adequately protected.	 Spotted Handfish Recent survey work has focussed on repeating quantitative population counts at known locations in order to monitor population trends. These surveys also monitor aspects of habitat quality, such as density of invasive species, and of laying substrate. Little work has gone into identifying new areas where spotted handfish might live or in re-exploring old sites where spotted handfish were known to occur in the past. Spotted handfish now appear to be confined to nine sites within the Derwent Estuary, although four of these sites have not been surveyed since 2007. A number of these sites have been surveyed on several occasions since 1997 which has provided an indication of population trends. Only one known spotted handfish colony in the Derwent – at Opossum Bay – is within a marine protected area (i.e. Opossum Bay Marine Conservation Area declared in December 2009). The other sites receive no special protection, above and beyond what is conferred to handfish through their protected species status. No spotted handfish have been found outside of the Derwent Estuary for a number of years. However, 	
	occupied sites outside of the Estuary may still exist but dedicated survey effort will be required to confirm the presence or absence of the spotted handfish. In December 2009 the Sloping Island Marine Conservation Area was declared by DPIPWE and one of its objectives is the protection of spotted and red handfish and their habitat. This decision was based on advice from scientists using a balance of probabilities that the historic known area of occupation may mean these species still exist in the region. No recent surveys have been conducted in this area.	
	Red Handfish	
	The red handfish are currently only found in the Primrose Sands region. This area is not currently included in any reserve system and the occupied area is immediately adjacent to seaside residential developments. Red handfish are also known historically from the Sloping Island region and this area was recently declared a Conservation Area (December 2009), partly to protect this species.	
	Ziebell's Handfish	
	Of the very few Ziebell's handfish that have been captured or seen in the wild, the most recent observations were from the Waterfall Bay area, Tasman Peninsula. Waterfall Bay lies within the Waterfall-Fortescue Marine Conservation Area. Most of the specimens held in the taxonomic collection were found around the Actaeon Islands and other locations in the lower D'Entrecasteaux Channel. These areas have no protection status. There have been no systematic efforts to survey for Ziebell's handfish since the 2005 recovery plan was put in place.	

3	Encourage work to resolve the taxonomy of the Waterfall Bay and Ziebell's handfish.	 Taxonomy investigation undertaken and results published: 'A revision of the Australian handfishes, with descriptions of three new genera and nine new species (Last and Gledhill 2009)'. The paper looked at the taxonomy of the Waterfall Bay (referred to as Loney's Handfish in the paper) and Ziebell's handfish and concluded that they were different colour morphs of the same species. The paper provisionally assigned the Waterfall Bay and Ziebell's handfish as a single species - <i>Brachiopsilus ziebelli</i>. Last and Gledhill (2009) also reassigned the genus of the red handfish from <i>Brachionichthys</i> to <i>Thymichthys</i>. Red handfish are now called <i>Thymichthys politus</i>. 	Complete	
4.	Encourage the Tasmanian government to develop and implement management programs to control and/or eliminate alien species which pose a threat to handfish and their habitat.	 Seventy nine introduced marine species have been recorded in the Derwent Estuary, including four high priority species for which National Control Plans have been developed (Whitehead <i>et al.</i> 2010). Of these species, the Northern Pacific seastar (<i>Asterias amurensis</i>) is considered to pose the greatest risk to handfish breeding and survival, as they are thought to eat the substrate that handfish use to lay eggs. The Tasmanian Government has considered control measures for the Northern Pacific seastar and other introduced marine pests but, currently, there are no viable, cost effective methods available. A number of introduced species are potentially impacting on handfish species, although there is no empirical data linking introduced species to a decline in numbers. The Northern Pacific seastar (<i>Asterias amurensis</i>) is the most common introduced species in and around the Derwent. A number of native species may also be impacting on handfish numbers. In particular, densities of migrating spider crabs (<i>Leptomithrax gaimardii</i>) were very high in the Derwent Estuary during the 2012 handfish surveys. Although spider crabs are a native species they are usually found in deeper water, but with known migrations to shallow water areas. Handfish surveys in 2012 occurred during and after one of these large spider crab aggregations in shallow water, and it appears spotted handfish were significantly displaced. No follow up surveys have yet been undertaken to see whether this displacement was only temporary, or whether it may have more persistent effects on local population numbers. Previous spider crab aggregations are well-known in the Derwent and observations of such an occurrence at the Opossum Bay site, during handfish surveys conducted during 2000, did not result in a lasting effect. 		Not completed

5 Encourage the Tasmanian government, local governments and industry to take actions to minimise pollution from entering		There have been ongoing efforts by the Derwent Estuary Program (DEP) to manage the pollution and sediment in the Derwent Estuary. The DEP is a regional partnership between local governments, the Tasmanian state government, commercial and industrial enterprises, and community groups to restore and promote the Derwent estuary.
	handfish habitat.	• As part of the DEP, there have been significant improvements in the treatment of sewage, industrial wastes and storm water discharged into the Derwent estuary as a result of more than \$100 million invested by industries and local governments. Significant initiatives include (Whitehead <i>et al</i> , 2010):
		• Siteworks at Nyrstar Zinc smelter to reduce heavy metal discharges.
		• Expansion of the wastewater treatment plant at the Norske Skog paper mill, major effluent reuse schemes, capturing 20% of sewage effluent from the Hobart metropolitan area.
		• Numerous storm water management projects by local councils.
		• A sediment survey in 2011 showed declines in heavy metals in the Derwent Estuary. However, estuary fauna still have high levels of heavy metals, which may have potential impacts on survival and reproductive success (Pers. Com. Expert Working Group 2013).
		• Sediment loads in the estuary remain variable, with increased loads on a seasonal basis and depending on rainfall conditions (Whitehead <i>et al.</i> 2010). High turbidity levels as a result of increased sediment loads may smother egg masses and laying substrate and impact on algal levels (Pers. Com. Expert Working Group 2013).

Spotted

Where suitable spawning substrate for these species is lacking, encourage the introduction and maintenance of artificial spawning substrate and/or natural spawning substrate to increase reproductive success.
Artificial spawning substrate is caulerpa, a native a transplantation prograches the substrate becomes for 'fouled substrates' or known.
Caulerpa were consistent in the Derward state in the Derward state in the Derward state is called a substrate of the substrate state in the Derward state in the Derward state in the Derward state is called a substrate of the substrate state in the Derward state of the substrate o

6

Artificial spawning substrate trials have been tried at several locations, as have programs to transplant *Caulerpa*, a native algae that handfish are known to use as an egg laying substrate (Green 2005). These transplantation programs were moderately successful, although it was determined that it was quicker and cheaper to use artificial substrate than to collect, clean and transplant *Caulerpa*. Over time artificial substrate becomes fouled with marine growth but, even so, handfish eggs have been found on these 'fouled substrates' over successive years. The longer term viability of the substrates is not currently known.

- *Caulerpa* were collected in November and December 2004 and in March 2005 and transplanted to a site in the Derwent estuary. The area transplanted was approximately 600m². Three quarters of the transplanted *Caulerpa* were alive in November 2005. Handfish were seen using transplanted algae, including laying eggs. Project demonstrated potential of technique (Green 2005).
- An Artificial substrate trial was undertaken in 2011, using techniques shown to be effective from earlier trials (Green and Bruce 2000). Seventeen hundred artificial spawning substrates were constructed and planted across four sites before the breeding season. Although less than one percent of substrates were found to contain egg masses during the breeding season, the majority of egg masses were still found on the artificial substrates, suggesting the technique was effective (Green *et al.* 2012).
- There is no dedicated funding to continue to monitor and maintain the artificial substrate after 2012. Any continuation of the artificial substrate program will necessarily rely on securing additional funds and/or the services of volunteer divers.

7 Promote community awareness of the value of handfish as part of Australia's unique biodiversity through appropriately targeted education.		 There have been no empirical surveys to understand the level of community awareness of the value of handfish as part of Australia's unique biodiversity. However, anecdotal evidence suggests that the broader Hobart community is generally aware of the endangered nature of handfish and their reliance on the Derwent Estuary Handfish have been used as 'flagship species' to help promote clean-ups in the Derwent Estuary by the Derwent Estuary Program. 	So
		• The recent dive surveys conducted as part of the Caring for our Country funding were partially undertaken by volunteer divers from the Reef Life Survey program, the Institute for Marine and Antarctic Studies, the Tasmanian University Dive club and the CSIRO.	me progress
		• There have been several newspaper, magazine and Ezine articles on handfish and handfish conservation activities. E.g., National Geographic, ABC,	
		• Most media focus has been on the spotted handfish in the Derwent. There is little community awareness of the other handfish species.	

DISCUSSION OF RECOVERY ACTION IMPLEMENTATION

Overall, there has been a sustained effort to implement recovery actions for the spotted handfish in the Derwent Estuary. This has included regular repeat surveys of known colonies, the placement and monitoring of artificial laying substrates, declaration of marine protected areas in December 2009, and a general effort by government and industry to improve water quality. The only action in the Recovery Plan that was not initiated was the control measures for introduced species. Control measures for introduced species, of which the Northern Pacific seastar is considered the primary threat, were not undertaken as there are no cost effective, practical methods available. Instead, efforts to combat the effects of the seastar focussed on placing artificial laying substrate, a project that was moderately successful. In contrast to the relative success of the Recovery Plan to promote work to conserve the spotted handfish in the Derwent, little effort was directed at implementing recovery actions focussed on either the red or the Ziebell's handfish. This was primarily because resources were not available to survey and conduct any practical recovery work as these species occur in more exposed regions. These other species are also so rare that they are extremely difficult to find, even if specifically searching for them.

There has been a relatively focussed attempt to undertake regular survey work for spotted handfish in the Derwent estuary. These surveys provide a good understanding of the population trends, the quality of the available egg laying substrate and the types and numbers of introduced pests. There has, however, been little survey effort in areas outside of the Derwent and no dedicated surveys to find populations of red and Ziebell's handfish, primarily due to difficulty and cost.

The programs to install artificial egg laying substrates have been generally successful. Initially, trials were undertaken to transplant Caulerpa which is not

eaten by the Northern Pacific seastar but, although moderately successful, it was considered easier to use artificial substrates than to collect, clean and transplant live material. Future trials are likely to continue using artificial substrate. Who will maintain, clean and, potentially remove the artificial substrate in the future has not yet been determined and remains an ongoing problem with the artificial substrate program.

The Northern Pacific seastar – an introduced marine pest - is considered to pose a significant threat to the spotted handfish, as they are known to eat the stalked ascidians that handfish use to lay eggs. The Tasmanian Government has not undertaken any management programs to control and/or eliminate Northern Pacific seastar, or any other introduced pest that potentially threatens handfish in the Derwent Estuary. However there are currently no viable, cost effective management options available to manage these species. Until new control methods become available, it is unlikely programs will be undertaken to control any of the introduced marine pests currently in and around handfish habitat.

The handfish have successfully been used as a flagship species to support ongoing efforts to clean up the Derwent Estuary. Clean up efforts over recent years, through the Derwent Estuary Program, have been successful in reducing sediment load and reducing water born pollutants, particularly of some heavy metals. However, sediment loads can sometimes still be high, particularly after rain, and there is not yet any indication that a generally healthier estuarine environment has lead to increase in the survival and reproductive success for spotted handfish.

Recovery objective Recovery criteria Status Comments progress* There are nine known sites where spotted handfish occur, all in the Derwent Estuary. Of those, To identify, protect and 2 (Derwent) Habitat areas for all only one colony- Opossum Bay - occurs within a marine protected area (i.e. Opossum Bay manage populations and species are 0 (other areas) habitats of the handfish adequately managed Marine Conservation Area declared in December 2009). The only known colony of red handfish and protected from - at Primrose Sands - has no official protection. However, one of the objectives of the nearby species covered by this plan Sloping Island Marine Conservation Area (declared in December 2009) is the protection of threats to ensure anthropogenic spotted and red handfishes and their habitat. The Waterfall-Fortescue Marine Conservation Area, threats do not limit also declared in December 2009, encompasses the Waterfall Bay region, a region where Ziebell's population growth of these handfish has been found in the past. Areas south of the D'Entrecasteaux Channel, around the species. Actaeon Islands, are historically a Ziebell's handfish location but have no conservation status. The Marine Conservation Areas are lower level marine protected areas (which still permit fishing activities subject to broader fisheries regulations such as size, bag and possession limits and local gear restrictions) consistent with IUCN category VI. Significant clean-up efforts have been undertaken in the Derwent Estuary, which will hopefully lead to increased reproductive success for the spotted handfish colonies known to occur there. However, no noticeable increase in population numbers has occurred to date. Despite efforts directed at improving water quality in the Derwent, there remain a number of water quality issues, particularly related to sediment after heavy rainfall and potential runoff issues associated with developments around the Estuary. Although there are strict planning rules for foreshore developments, there is little information as to how well these rules are applied and enforced. Further, it is often difficult for developers to find out the location of handfish colonies within the Derwent and there is little guidance on suitable mitigation measures. Introduced marine pests remain an issue for the spotted handfish. While the Derwent does contain significant numbers of introduced pests, such as the Northern Pacific seastar and the piecrust crab, there are no practical, cost effective management options available to control their numbers. Indirect management tools, such as the placement of artificial egg laying substrates remains the only viable method to compensate for the loss of laying substrate caused by the Northern Pacific seastar. Currently there is limited knowledge of the distribution of red and Ziebell's handfish. Without more knowledge of the location of the colonies for these species, it is not possible to determine if their key habitat areas are adequately protected.

2.0: EVALUATION AGAINST RECOVERY PLAN OBJECTIVES

		It is unclear what other issues may be impacting on handfish colonies, particularly those in the Derwent. Without a better knowledge of the full range of impacts it is difficult to assess whether the known colonies are adequately protected. Other impacts not previously considered include habitat damage from anchor chain drag, impacts from native species that may have changed in abundance (e.g., spider crabs) and the consequences on survival and breeding from long-term climate change.
Populations demonstrably increase, or show signs of stabilising	2 (spotted handfish) 0 (Ziebell's and Red)	There is no compelling evidence from the repeat surveys from five known sites in the Derwent Estuary that populations of spotted handfish have demonstrably increased or even generally stabilised since the handfish recovery plan was enacted. While there is evidence that some of the colonies may have stabilised, the data suggests that the majority of colonies have continued to decline in numbers. There has been no systematic survey effort undertaken on either red or Ziebell's handfish. Without supporting survey data it is not possible to conclude that the populations of these species has increased or even stabilised. Red handfish were previously known from several locations in south-east Tasmania. Recent observations, however, have been restricted to one location, suggesting ongoing declines in numbers.
Effective management programs to control or minimise the impacts of alien species are in place for all sites where alien species threaten spawning substrate for the species.	2 (spotted handfish) 0 (Ziebell's and Red)	There is currently no effective control measures for any of the alien species found in handfish habitat. The Northern Pacific seastar is generally considered the primary pest species, and it is speculated the seastar impacts on handfish by eating available laying substrate. Other introduced species also inhabit handfish habitat (e.g., piecrust crab) but it is unclear if these species are impacting on handfish breeding or survival. The programs to introduce artificial laying substrate for spotted handfish in the Derwent goes someway to managing the impact of the Northern Pacific seastar but it remains unclear as to how effective these programs will be in the long-run and whether the addition of the substrates will be sufficient to offset the impacts of the marine pests.

*Status progress: 0 = Cannot be assessed (criterion not measurable or actions to measure not implemented) = achievement of objective can't be assessed

1= No progress towards meeting criteria = objective not achieved; 2 = Criterion not met but some progress = objective partly achieved; 3 = Criterion met = objective achieved

DISCUSSION OF ACHIEVEMENT OF RECOVERY PLAN OBJECTIVES

The objectives of the Recovery Plan have been partially met for the spotted handfish in the Derwent estuary. The known colonies have been systematically surveyed on several occasions, artificial substrates have been trialled and some of the colonies appear to be at least stable. The work undertaken to-date on the spotted handfish has been important in helping locate additional colonies and in improving understanding of how populations have changed over-time. The work in installing artificial substrates for egg laying have demonstrated a viable and cost effective way to improve the reproductive success of spotted handfish. However, the survey data also show that some of the colonies of spotted handfish have experienced significant population fluctuations since the recovery plan was enacted and that some of the colonies appear to have undergone a long-term decline. The only known local population of Spotted Handfish found outside of the Derwent Estuary since the start of investigations in 1997 was at Primrose Sands. This population underwent a local extinction sometime between surveys in 1999 and 2005 and, as there were no resources to implement planned surveys between these dates, the cause is not known (Bruce and Green, 1998; Green, 2005).

The Handfish Recovery Plan identified action against introduced pests as a key 'Recovery Action'. However, currently there are no viable methods to control any of the introduced pests in south-east Tasmania. Physical removal has been attempted but is not logistically possible due to the difficulty and expense of removing the pests individually and because the pest species are highly prolific breeders meaning that any short term achievements are quickly lost due to re-colonisation. However, the alternative to physical removal – that of introducing artificial substrate – has shown some success, with handfish eggs being found on the substrates. The long-term viability of this approach, however, is yet to be determined.

Limited progress has been made on implementation of the Recovery Plan actions, including basic surveys, for the other either the Red or Ziebell's handfish. This lack of effort is mostly to do with limited funds and the difficulties of effectively surveying such rare and hard to find species.

Overall, the Handfish Recovery Plan has been effective in stimulating research and funds for work on the spotted handfish. The Recovery Plan actions were used as part of the Caring for Our Country bid, which ultimately supported surveys in the Derwent and helped the artificial substrate project. However, much of the work on the spotted handfish has also relied on volunteer efforts, as the available funds have generally been insufficient to carry out extensive projects. It should also be noted that little effort has been directed towards research and/or the application of protective measures for the other two species of handfish covered under the Recovery Plan. The other two handfish species live in more exposed areas, are harder to survey and manage and are also extremely rare.

3.0: CHANGES IN CONSERVATION TRAJECTORY

Understanding at time of publication of RP					
Distribution, abundance	Full details of the species distribution, abundance, ecology, habitat and threats are contained in the Issues Paper produced to				
Ecology, habitat	support the development of the Handfish Recovery Plan. The issues paper can be found at:				
Threats (include degree of threat, location and timing)	http://www.environment.gov.au/biodiversity/threatened/publications/recovery/4-handfish/index.html				
Trajectory predicted					
Changes in understanding s	since the Recovery Plan was made:				
Distribution, abundance	 The survey work on the spotted handfish in the Derwent Estuary has increased the number of sites at which the species was known and provided good baseline data with which to compare changes in population over time. No substantive additional information has become available on the distribution and abundance of the red or Ziebell's handfish. 				
Ecology, habitat	• The photo-identification study provided valuable information on movement over time, and confirmed limited movement by adult spotted handfish (Moriarty 2012).				
Threats	• Identified threats to the spotted handfish remain largely unchanged from those described in the 2005 Recovery Plan.				
Trajectory predicted	• The spotted and red handfish were both up-listed from endangered to critically endangered, confirming a decline in their conservation status.				
Evaluation of change in conservation trajectory of the species					
The survey work suggests that some of the spotted handfish colonies in the Derwent have been relatively stable over time, while others are possibly in decline. This suggests that with ongoing effort – particularly in regards to improving the environmental health of the Derwent - the spotted handfish colonies may at least be stabilised, albeit at very low numbers, and may even increase over time. The lack of confirmed sightings for the other species is of concern, and suggests an ongoing decline in numbers and colonies.					

Discussion of Recovery Plan contribution to changes in conservation trajectory

The ongoing survey work of the spotted handfish has provided excellent baseline data with which to compare any future changes in population status. The continuing focus on this species has also meant that recovery actions – such as the use of artificial substrate to improve breeding success – have been tested and provided information that can be used to help ensure the long-term survival of the species.

4.0: RECOMMENDATIONS FOR FUTURE ACTION

Actions required to maximise chances of long-term survival in nature	Existing, modified, new	Existing mechanisms (if any)	Comments (include rationale)
Monitoring program	New	The monitoring program is opportunistically funded (i.e., no secure funding). Recent funds came from the DEP.	An ongoing monitoring program is important as it will help evaluate subsequent recovery actions.
Expanded monitoring program	New	N/a	Current monitoring focuses on the spotted handfish in the Derwent Estuary. This program should be expanded to include re-surveying known historical populations of handfish outside of the Derwent to establish current range and abundance. Such a program would also highlight areas that may require additional ongoing protection.
Continue artificial substrate project	New	The artificial substrate program was funded through the DEP.	The artificial substrate project was undertaken as part of a Caring for Our Country grant. The project demonstrated that handfish used the substrate and that the substrate had the potential to improve reproductive success. The CFOC grant has now been completed and new funds are required to continue the project.
Review of artificial substrate project	New		There are questions about the long-term effectiveness of the artificial substrates, their potential use by introduced and predator species, and how and who will maintain these substrates into the future.
Controls on foreshore developments	Ongoing	Planning regulations on foreshore developments.	There are currently a number of planning laws and regulations that control foreshore developments.
Investigation into the effectiveness of existing measures to manage the impacts of foreshore developments.	New	N/a.	Although planning regulations exist, it is unclear how effective these regulations are at reducing and eliminating impacts from developments on handfish habitat and how they can be improved to improve conservation prospects.
Continue efforts to improve water quality in the Derwent estuary	Ongoing	The Derwent Estuary Program (DEP)	The DEP currently coordinates programs to clean-up the Derwent Estuary. Improvements to the water quality in the Derwent will likely assist the recovery of the spotted handfish.

Discussion of recommendations for future actions

Based on the review of the 2005 Handfish Recovery Plan, it appears that the threats to the species remain largely unchanged and that known handfish populations have not demonstrably increased in size. While some colonies of spotted handfish appear to be at least stable in the Derwent, other colonies have experienced large fluctuations in numbers and appear to be in long-term decline. The Handfish Recovery Plan is set to expire in April 2016. After the plan expires, handfish will still receive protection as a listed species and the published conservation advice will remain relevant. However, given that there are a number of relatively simple actions that could be implemented to boost the survival of the spotted handfish, a revised recovery plan, removing the completed actions and adding new conservation priorities, would be of value for this species. Although there appears to be limited potential to enhance the survival status of the other two species of handfish included in the current recovery plan, if a new recovery plan was developed based on actions to conserve the spotted handfish, there would be compelling reasons to include the other two species in the same plan.

Suggested model for species management

This review recommends that the current recovery plan for the three species of handfish be revised and updated to remove completed actions and include new conservation priorities. This recommendation is based on: 1) that two of three handfish species included in the recovery plan are now considered to be critically endangered; 2) populations of the spotted handfish - the only handfish species for which good data on population trends exist – appear to be stable, albeit at very low numbers, at some of the known sites but in decline in others; and 3) there are relatively cost effective methods available to increase reproductive success.

5.0 INFORMATION SOURCES AND REFERENCE MATERIAL

- Bruce, BD and MA Green. (1998). Spotted Handfish Recovery Plan 1999–2001. Report for the Endangered Species Program, Environment Australia, CSIRO Marine and Atmospheric Research. pp 41.
- Green, MA. (2005) Marine habitat rehabilitation and threatened fish investigation. Report for Threatened Species Section, Biodiversity Conservation Branch, Tasmanian Department of Primary Industry and Water. CSIRO Marine and Atmospheric Research, Hobart TAS. pp. 22.
- Green, MA. (2007) Implementing handfish Recovery Plan 2006/7. Report for Threatened Species Section, Biodiversity Conservation Branch, Tasmanian Department of Primary Industry and Water. CSIRO Marine and Atmospheric Research, Hobart TAS. pp. 27.

Green MA. (2008). Handfish 08-09 – NRM South Final Report. CSIRO Marine and Atmospheric Research, Hobart, TAS. pp 20.

- Last, PR and Gledhill, DC (2009). A revision of the Australian handfish (Lophiiformes: Brachionichthyidae), with descriptions of three new genera and nine new species. Zootaxa 2252: 1–77.
- Moriarty, T (2012). Can a Spotted Handfish (*Brachionichthys hirsutus*) change its spots? Assessing photo-identification and spot matching software to study a critically endangered species. Honours Thesis. University of Tasmania.

SEWPAC, (2012a). http://www.environment.gov.au/biodiversity/threatened/species/pubs/64418-conservation-advice.pdf

SEWPAC, (2012b). http://www.environment.gov.au/biodiversity/threatened/species/pubs/83756-conservation-advice.pdf

Whitehead J, Coughanowr C, Agius J, Chrispijn J, Taylor U, Wells F, ©2010. State of the Derwent Estuary 2009: a review of pollution sources, loads and environmental quality data from 2003 – 2009. Derwent Estuary Program, DPIPWE, Tasmania.

Expert Panel - A workshop was held on the 19 June 2013 in Hobart to discuss the Review of the Handfish Recovery Plan. Neville Barrett – University of Tasmania Luke Einoder - Derwent Estuary Program Mark Green – CSIRO Ashley Leedman (Chair) – Department of Sustainability, Environment, Water, Population and Communities (Australian Government) Rick Stuart-Smith – University of Tasmania Grant Pullen – Department of Primary Industries, Parks, Water & Environment (Tasmanian Government) Anthony Reid - Department of Primary Industries, Parks, Water & Environment (Tasmanian Government) Cath Samson – Parks and Wildlife Service (Tasmanian Government) Jason Whitehead - Derwent Estuary Program Alison Woolley – Department of Primary Industries, Parks, Water & Environment (Tasmanian Government)