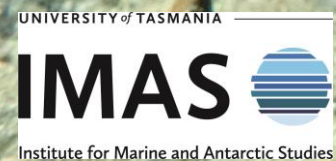


Red handfish conservation

Population + habitat restoration

Jemina Stuart-Smith, Tyson Bessell,
Olivia Johnson, Andrew Trotter



RED HANDFISH

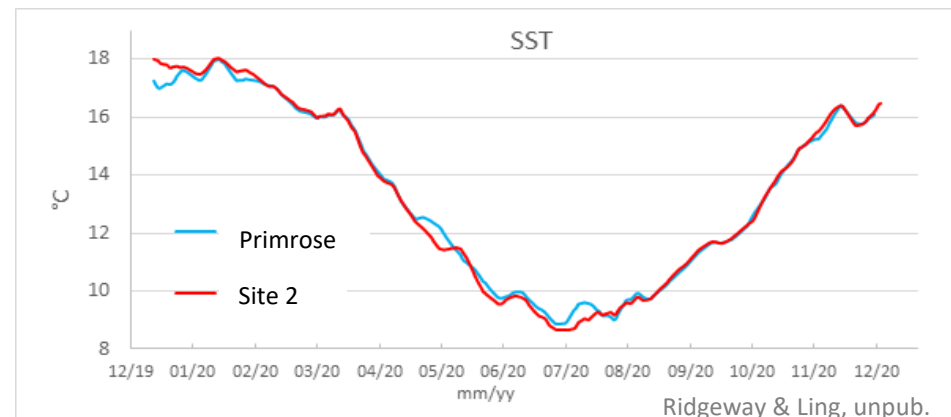
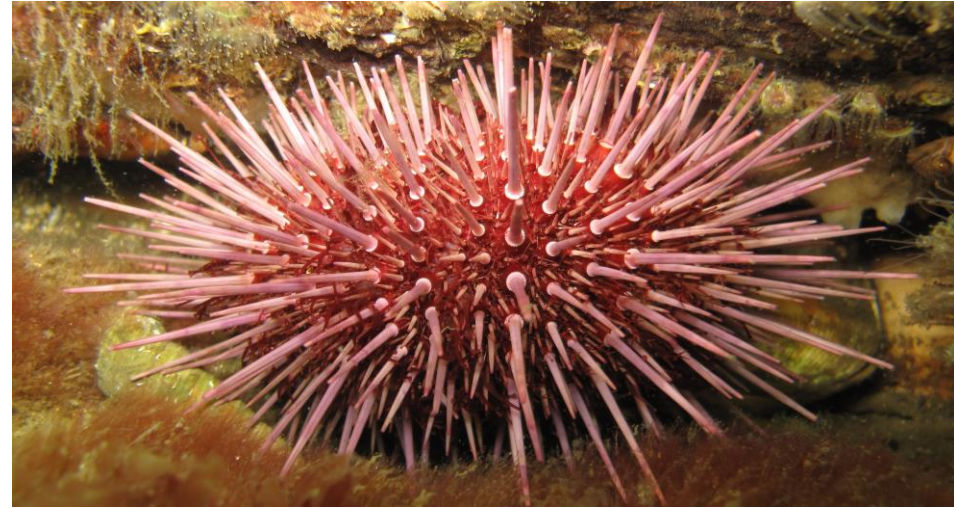
Thymichthys politus
Critically Endangered

- Small, marine anglerfish
- Modified pectoral fins
- Endemic to Tasmania
- Shallow rocky reefs - seaweed & seagrass
- Two small populations near Hobart
- Protected EPBC Act & Living Marine Resources Act



THREATS

- Habitat loss/degradation
 - Trophic cascade (removal of lobsters) resulting in increases in *Heliocidaris erythrogramma* and overgrazing of seaweed
 - Pollution/siltation/urban development/nutrients
- Climate change (temperature trap)
- Human disturbance – boating/anchoring, divers
- Small, fragmented populations



VULNERABILITIES

- Low reproductive output (few eggs)
- Limited dispersal capability
 - No planktonic life stage
 - Locomotion via walking
- Threats across entire range
- Low genetic diversity (presumably)

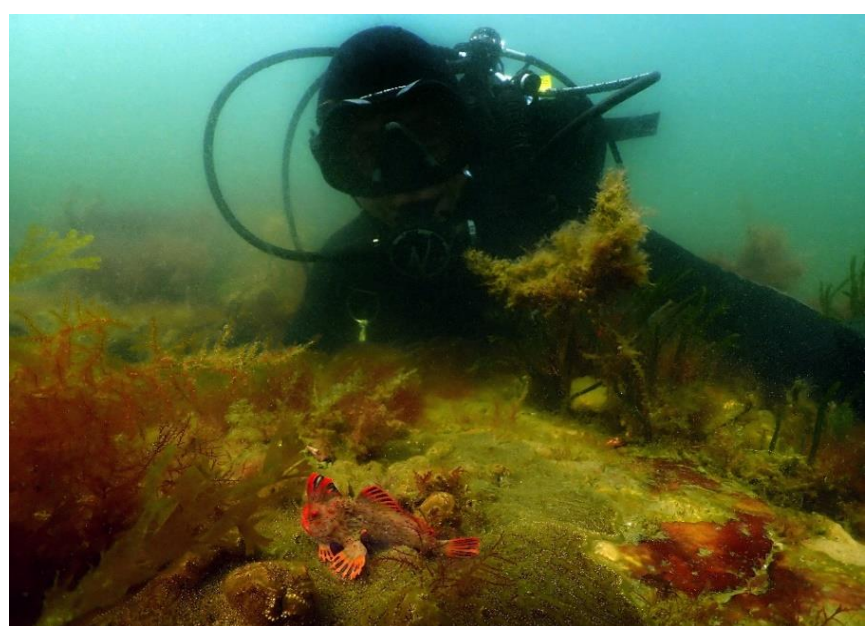


Image: Olivia Johnson

RECOVERY PLAN & TEAM

Guiding research & conservation

Recovery plan objective:

- Increase the understanding of the biology and ecology handfish in order to conserve, and contribute to the species recovery

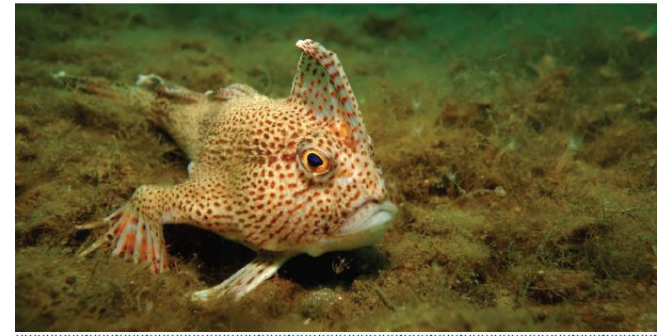
Recovery strategies:

- Increase spawning success
- Reduce impacts
- Options for active management
- Improve knowledge (distribution, abundance, population trends)
- Increase understanding of habitat health and threats
- Encourage community participation in the conservation of handfish



Recovery Plan for Three Handfish Species

Spotted handfish *Brachionichthys hirsutus*
Red handfish *Thymichthys politus*
Ziebell's handfish *Brachiopsilus ziebelli*



December 2015

COMMONWEALTH PRIORITY

Top 100 priority threatened species (2021)

Commonwealth Oceans Leadership package (2022)

- Aquaculture
- Population monitoring
- Best Prac Guidelines

NRM South – Environment Restoration Fund (2022)

- Habitat monitoring
- Habitat restoration



100
Priority Species

Threatened Species Strategy

100 priority species have been selected to help focus the efforts of the Australian Government and partners on threatened species recovery actions.

Focused efforts will contribute to the Strategy's high-level objective:

TO IMPROVE THE TRAJECTORIES OF PRIORITY THREATENED SPECIES BY 2031

The priority species list includes plants and animals found across Australia in a range of environments, from the arid deserts to rainforests, forests to grasslands, and inland waters to the sea. All taxonomic groups listed under the *Environment Protection and Biodiversity Conservation Act* are included. Recovery actions for many of the priority species will also benefit other threatened species that share their habitat.

Selecting priorities

The 100 priority species were selected using a multi-criteria decision analysis process, using scores against the Threatened Species Strategy's 6 prioritisation principles. Over 1800 species listed under the EPBC Act as either Critically Endangered, Endangered or Vulnerable during the first quarter of 2021 were reviewed as part of this prioritisation process. Species were scored using national-scale data sets by independent ecologists and the Australian community was also invited to have a say on species important to them.



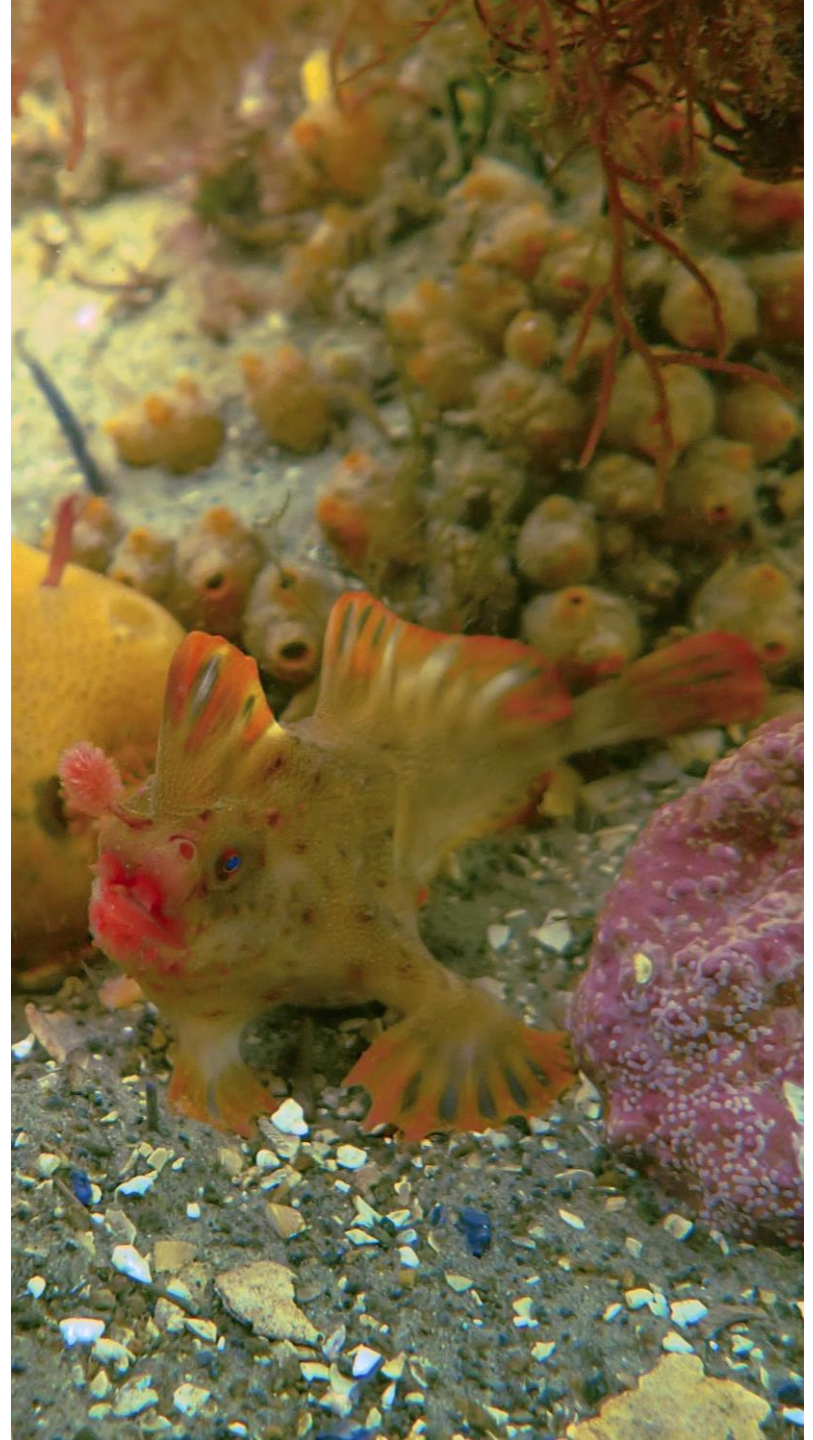
Figure 1. Spread of the 100 priority species across taxonomic groups and the environments primarily occupied.

Prioritisation principles

Risk of extinction Species under severe and imminent threat	Multiple benefits Recovery action will benefit other species	Feasibility and effectiveness Action can make a difference and is cost-effective	Importance to people Culturally significant species	Uniqueness Species without close relatives and not found anywhere else	Representativeness Balance the overall list across taxa, land and seascapes, tenures and jurisdictions
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CONSERVATION MEASURES

Combination of monitoring of wild populations, aquaculture (to improve juvenile survival), mitigating key habitat threats, habitat restoration trials, and diver awareness.



POPULATION MONITORING

Combination of Reef Life Survey transects (50x1m), and Bessell PhD surveys (50x3m)

Fish size, location, habitat & substrate type, photo ID

Population estimate, movement, habitat use, other observations



(Image: Tyson Bessell)

POPULATION ESTIMATE

Mark-recapture approach to estimate abundance (from 3 years' observations, Bessell PhD & Reef Life Survey transects)

- 397 observations

Abundance (adults)

- Site 1: 7 (95% CI 5-10)
- Site 2: 94 (95% CI 40-231)

Site 1: ~1,000 m²
Site 2: ~3,000 m²

Movement:

- Mean movement 26.7m/year
- Greatest distance moved was 99.5m/year
- 12 of 54 resightings were found 10m from original sighting



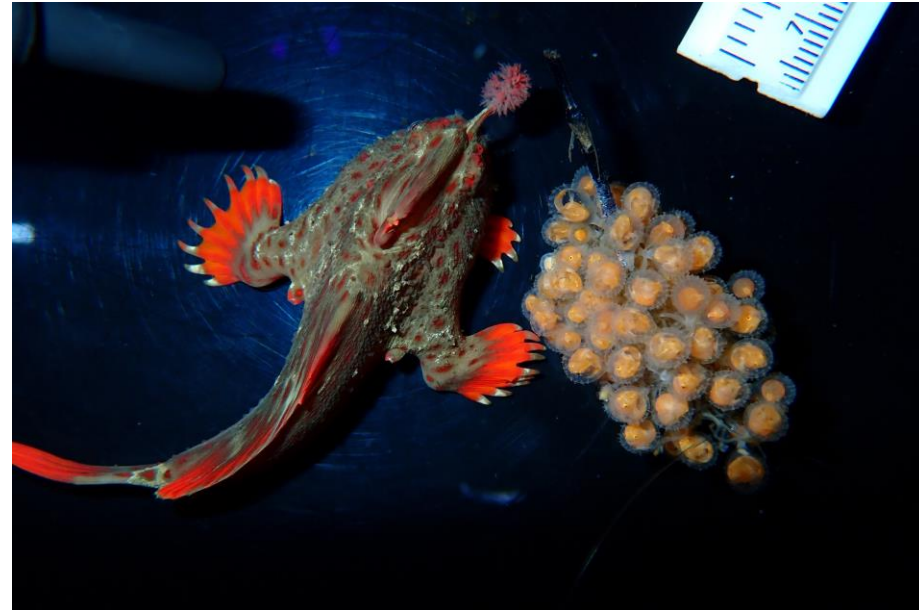
(Bessell *et al.*, in review)

POPULATION RECOVERY EFFORT

Head-starting strategy

Aim: improve juvenile survival

- Protection during early life stages
- Ideal conditions for growth/survival



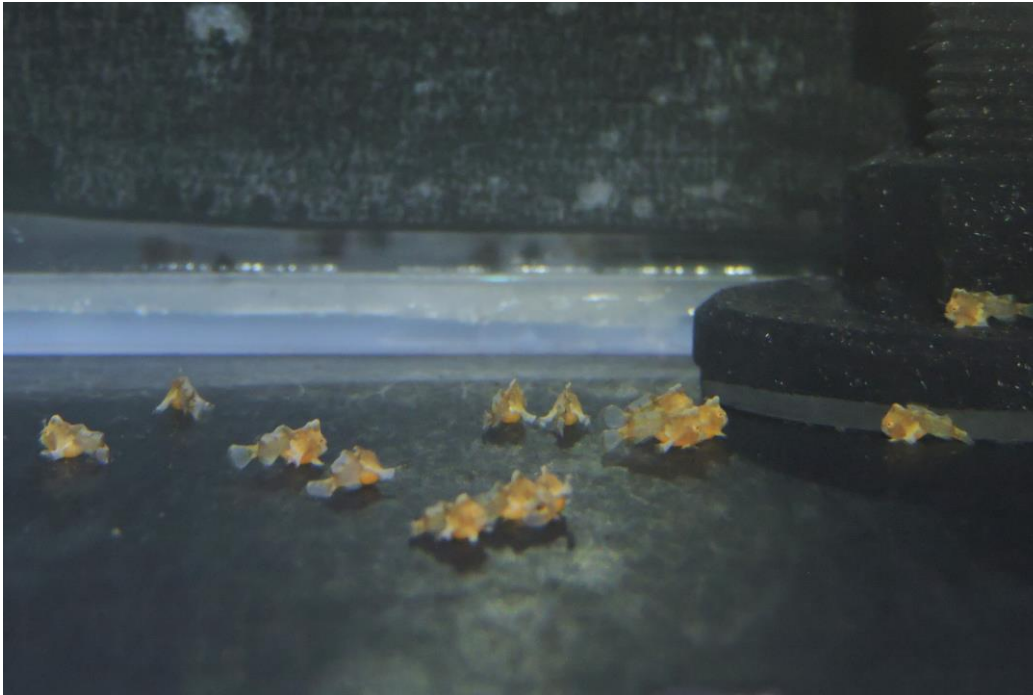
Limitations:

- Cannot tell males & females apart (i.e. cannot rely on captive breeding – need to collect fertilized eggs from wild)
- Funding and ability to properly acclimate fish before release

HEAD-STARTING

Year	Egg collection	Survival @1year	Survival @2yrs	Released (2020)
2018	1.5 clutches	50 hatch, 16 survived		8
2019	2 clutches	71 hatch, 51 survived	10 (@ 3years)	34
2021	2 clutches	134 hatched, 93 survived		
2022	1 clutch**	24 hatched, 15 survive (4 mo)		

**first captive breeding event

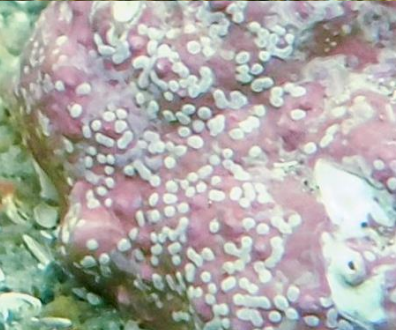


Post release survival – still processing data, likely low – but an individual at least 7 months post-release

Had limited pre-release acclimation resourcing

Limitations revisited

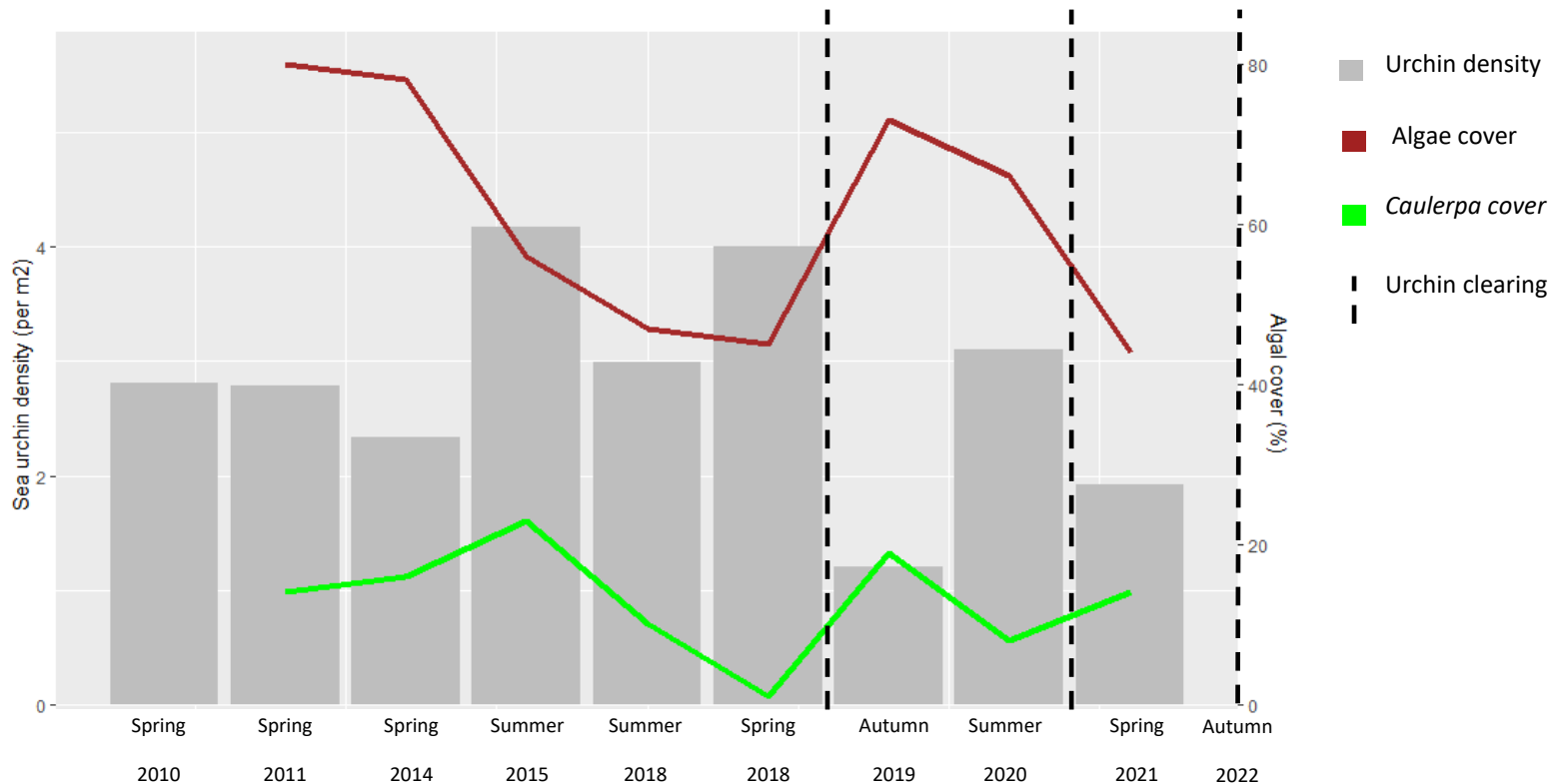
- Cannot tell males & females apart (i.e., cannot rely on captive breeding – need to collect fertilized eggs from wild)
- Funding and ability to properly acclimate fish before release



HABITAT MANAGEMENT: RESTORATION

Urchin removals conducted

- Site 1 2018 (~6000 urchins from within site; (~4 m² to 1 m²)
- Both sites 2020 (around sites) ~17000 urchins
- Site 1 2022 (~6000 urchins)



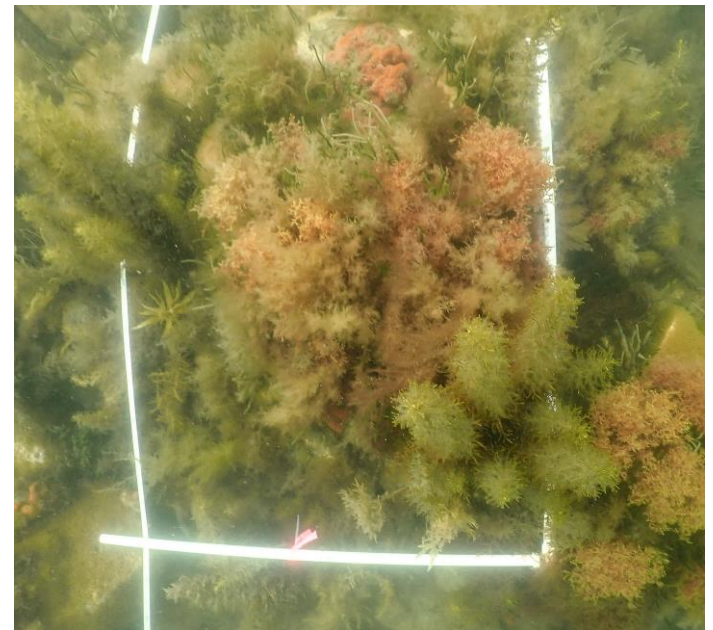
HABITAT MANAGEMENT

Seaweed translocation (attached to boulders from nearby area)

To urchin barrens adjacent to handfish sites – assess persistence as an avenue/technique for accelerating habitat restoration

In combination with urchin removals

(Project underway)



(Cayne Layton, Victor Shelamoff, Tyson Bessell, & Olivia Johnson)

BEST PRACTICE GUIDELINES

for diving & snorkelling with handfishes

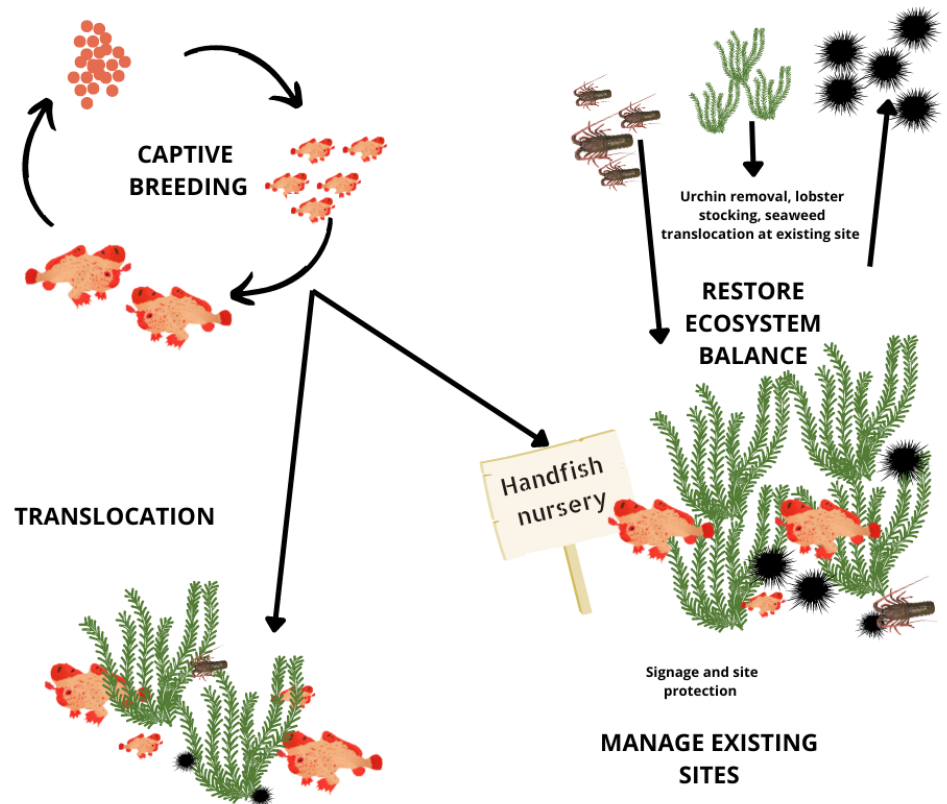
Partnered with local dive groups/shops/community to develop some best practice guidelines for diving/snorkelling with handfishes

- Create awareness/education/stewardship
- Safeguard handfish/habitats by providing practical ideas for minimising disturbance



FUTURE

- Continued head-starting – refining pre-release protocol/conditioning
- Captive-breeding/insurance population (incl genetics)
- Continued habitat restoration
- Exploring options for translocation
- Continue to work with local authorities to implement site protection to facilitate sustainable recovery



ULTIMATE NEED: habitat management to restock natural urchin predators (rock lobsters) back to existing sites, and protection to allow them to remain and restore ecosystem balance

THANK YOU

handfish.org.au

Acknowledging support from a huge team of people that includes: Rick Stuart-Smith, Tim Lynch, Neville Barrett, Graham Edgar, Lincoln Wong, Antonia Cooper, Ella Clausius, Greg Smith, Caleb Gardner, Molly Christensen, Sophie Broomhall, Andrea Wirtz, Geoff Endo, Marnie Redhead, Ross Goldsmid, Rob Perry, Alex Kreiss, Jane Dunnett, Kate Picone, Karen Watson, Mathew Allen, Dean Giosio, Craig Thomas, Charlotte Levi, Jose Garcia, Lafuente, Toby Bolton, UTAS Animal Ethics team, Jayson Semmens, Peter Last, Mark Green, Tim Fountain, Sharon Appleyard, Carlie Devine, Helen O'Neill, Curt Chalk, members of the NHRT, Scott Ling, Jane Ruckert, Simon Talbot, Antony Cave, John Keane, Vanessa Mann, Grant Pullen, Renison Bell and the Tasmanian Commercial Divers Association, Stefi Faber, Chloe James, Rachelle Hawkins, Laurette Johnston, Kuan Nee Lim, Chris Carey, Jesse Chippindall, Clint Hawkins, John Anderson, Adam Duraj, Debra Jones, Dydee Mann, Hamish Hall, Melanie Stanger, Katherine Richardson, Jane Bamford, Karen Lyttle, Benita Vincent, Jenn Hoy, Lisette Robertson, Kate Fraser, Alex Hormann, Dane Jones, Liz Oh, Jess Kube, Reef Life Survey divers (Andrew Green, Kris O'Keeffe, John Turnbull, Kevin Smith, Martin Püchert, Louise de Beuzeville).

UNIVERSITY of TASMANIA
IMAS
 Institute for Marine and Antarctic Studies

CSIRO

Marine Biodiversity Hub
 National Environmental Science Programme

RLS
 REEF LIFE SURVEY

SEAHORSE WORLD
 A world first in Tasmania

Derwent Estuary Program

SEA WORLD RESEARCH & RESCUE FOUNDATION

صندوق محمد بن زايد للمحافظة على الكائنات الحية
 The Mohamed bin Zayed SPECIES CONSERVATION FUND

Tasmanian Government

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