

SAVING THE LAST HANDFISH

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Photograph by Antonia Cooper.



Watch Dr Jemina Stuart-Smith talk about Tasmanian handfish at:
<https://www.facebook.com/OceanGeographic/videos/291256845256648/>

IMAGINE DIPPING A TOAD

in some brightly coloured paint, telling it a sad story, and forcing it to wear gloves two sizes too big.

I vividly recall uncovering my first Red Handfish from beneath a tangled mess of seaweed. I had been busy scouring the rocky reef, searching for cryptic fishes and invertebrates as part of the ReefLife Survey (RLS) marine life monitoring program. We were surveying the only Red Handfish (*Thymichthys politus*) site known to exist at the time. It was a relatively shallow dive, with cold Tasmanian sea temperatures. I was nearing the end of my transect line, fast approaching my thermal tolerance threshold, which admittedly is

not particularly high, and had begun to doubt I would see a handfish that day. Red Handfish are notoriously tough to find.

At the time, we estimated there to be fewer than 30 adults on the planet, and their numbers were dwindling rapidly due to deteriorating habitat, increasing pollution, and a whole host of other threats. The Red Handfish also has an activity regime that could only be described as lazy; they barely move, making them even harder to notice.

With hopes fading, I pushed aside a thicket of seaweed with both hands to reveal a bright little Red Handfish sitting on the ocean floor, less than an arm's-length from my face, and measuring a whole six centimetres in size. It did not move, either not caring, or simply not impressed with its sudden exposure. I did not move either, not wanting to look away for fear that it would dart off to the side and become forever hidden again in a patch of thick weed or in a rock crevice.



Red Handfish, barely six centimetres long. Photograph by David Doubilet.



Three divers scouring a small area for what is possibly be the cutest little fish in the world. Photograph by Kris O'Keeffe.

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I remember staring at it intently, feeling a little guilty for having invaded its hiding spot, but also trying to memorise its assortment of quirky features: an upturned mouth, a fluffy illicium perched on its head, the big red pectoral fins splayed out like hands used to 'walk' across the sea floor, the rough skin with patchy red spots, and the mohawk-like red dorsal fin standing high atop its head. Someone once said that if you have never seen a Red Handfish before, you should imagine dipping a toad in some brightly coloured paint, telling it a sad story, and forcing it to wear gloves two sizes too big. A fair description perhaps, but in my opinion, one that does not really capture its beauty.

Fast-forward a few years, we have gone from opportunistic monitoring by local divers and the RLS crew at a single known site, to discovering a second population, bringing our current estimated population size to almost 100 adults. We quickly put into motion the implementation of an emergency habitat management plan to remove thousands of habitat-modifying urchins. We are also conducting full censuses of both populations, engaging a PhD student to look at growth, fine-scale habitat use and the possibility of using eDNA to refine our search for more. We are now starting to sequence their genome, setting up an entire program focused on protecting

them from extinction, implementing a fundraising and awareness campaign (via the Handfish Conservation Project, handfish.org), and hatching handfish eggs in captivity. This tiny little fish, perhaps quite underwhelming to some, suddenly has teams of people vying for its survival.

The research and conservation work behind this movement is being driven by the National Handfish Recovery Team, a group of dedicated people from a range of different fields, including managers, conservation geneticists, students, industry partners, and researchers. The work is supported by the Institute for Marine and Antarctic Studies (IMAS) at the University of Tasmania, and Commonwealth Scientific and Industrial Research Organisation (CSIRO) within the National Environmental Science Programme Marine Biodiversity Hub, along with a range of other people and organisations, including the Australian public who have generously donated to the fundraising component. We're working with the Australian Government (Department of Environment & Energy), Tasmanian Government, and have received generous support from the Mohammed bin Zayed Conservation Fund and Sea World Research and Rescue Foundation Inc. It is truly a collaboration of forces to save this tiny fish.

As part of this conservation effort, one of the biggest leaps we've taken is to implement a 'head-starting' program to try to bolster wild population numbers. In a nutshell, this involves collecting eggs from the wild and hatching them in captivity where the young can grow, free from predators and adverse environmental conditions, and are given an abundant food supply. The idea is that this will result in returning more



Red Handfish with eggs.
Photograph by Antonia Cooper.

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juveniles to the wild than would survive naturally through these vulnerable early life stages.

It is a relatively simple concept, assuming you are able to find and hatch handfish eggs, care for baby handfish, and then train juveniles to be able to cope with natural conditions and survive in the wild. Obviously, there is not a whole lot

of literature on any of this. They hatch at approximately 3-4 millimetres in size — hard enough to see, let alone look after. Despite this, dwindling population numbers and increasing threats firmly galvanised the team's decision to proceed with a head-starting program. We unveiled the concept in 2018, with the help of Seahorse World (in northern Tasmania), which has 16 juvenile handfish in captivity there.

Following that, in late 2019, we successfully collected two egg clutches from the wild and transferred them to the IMAS Aquaculture facility. Tensions were high at all stages — collecting, waiting, observing. Seeing handfish eyes peering out, and watching chubby little fish wriggle from within their eggs before bursting free was exciting, but also nerve-wracking.

We had a few tense moments early on, including mortalities during egg development and at hatching, as well as finding parasites in our tanks. This is probably the usual suite of issues faced when hatching and rearing any fish species, but made significantly more intense when you are talking about the survival of an entire species.

We currently have over 60 juvenile Red Handfish growing in captivity at IMAS. They are over three months old, and around 1.5 centimetres in length. They remain in the care of an entire team of people, seven days a week, that is constantly feeding, cleaning and monitoring. We know the University veterinarian and Animal Ethics committee on a first-name basis, and any hint of odd behaviour sends an entire team of people into a flurry of action. We are currently planning our pre-release strategy of teaching handfish how to survive in the wild, and hope to release a batch of well-conditioned, well-reared juvenile Red Handfish later this year. It is a whole world of responsibility.

Head-starting alone is not a miracle cure, but it is an important component of a multi-faceted approach to improving the species' chance of survival. We still have limited knowledge of basic biological and ecological traits, and are working on improving this, at the same time as trying to implement habitat protection, continuing the search for more populations, and trying to



Photograph by Rick Stuart-Smith.

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improve public awareness and garner ongoing support.

The International Union for Conservation of Nature (IUCN) Red List of Threatened Species — the world's most comprehensive information source on the global conservation status of living things — recently reviewed the status of the entire handfish family and will soon publish the new assessments, including

officially listing Red Handfish as Critically Endangered. This recognition is an important step in being able to leverage support, drive action, secure funding, and increase the profile and plight of the species. Amidst all the grant-writing, handfish-schooling, permit applications, data collection, and plethora of other activities, we have all got one eye firmly focused on a bunch of slowly growing baby handfish. ○



Dr Jemina Stuart-Smith is a marine biologist at the Institute for Marine and Antarctic Studies (University of Tasmania) and the CSIRO. She coordinates the Handfish Conservation Project within the Marine Biodiversity Hub of the National Environmental Science Programme in Australia. Jemina's work focusses on aiding the recovery of critically endangered handfish species in Tasmania and restoration of their habitats. She has a keen interest in marine conservation and science education, and is a member of the National Handfish Recovery Team.