#66, March 2019

Newstreams

News, research, on-ground works, innovation and events with a focus on improving fish habitat

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AUSTRALIAN NEWS

Droughts and flooding rains and fish

The 2018 - 2019 summer is proving to be a challenging one for fish and their habitats across the country. January was the hottest and driest month on record across much of Australia (https://www.farmonline.com.au/story/5889066/january-the-hottest-month-on-record/?cs=5373), following on from similar conditions in December and November, drying rivers and wetlands and stressing riparian and floodplain vegetation. The immediate consequences for fish have been catastrophic in some areas, whereas elsewhere there will be longer-term effects. The fires in Tasmania will continue to impact fish for some time as ash and debris is washed into the creeks and rivers. The late arrival of the monsoon, with its delivery of a year's worth of rain in one week to areas of far north Queensland, has brought drought-breaking rain to western Queensland, which will enable access to food and habitat for the fish that can make their way up into those rivers, such as the Diamantina, Flinders and Thomson / Barcoo / Cooper Rivers (https://www.northqueenslandregister.com.au/story/5887415/cameras-telling-story-of-the-flood/?cs=4735). The resulting sediment plume into the coastal estuaries, seagrass beds and reefs is not especially good news for fish. There will also be an increased look-out for Tilapia, given these pest fish have the capacity to take advantage of floods to spread and were found in rivers that are now flooded (https://www.business.qld.gov.au/industries/farms-fishing-forestry/agriculture/land-management/health-pests-weeds-diseases/pests/invasive-animals/restricted/tilapia).

The Darling River. Photo: Murray Butcher.

Areas of North Queensland received a year's worth of rain in 7 days and western regions are flooded. Photo: North Queensland Register.

Unfortunately the monsoonal rain event will not provide significant water into the Murray-Darling Basin (https://www.abc.net.au/news/2019-02-05/queensland-floods-unlikely-to-aid-dry-murray-darling-basin/10780788).

The fish deaths in the Lower Darling River, western NSW, were a distressing and highly visible result. It appears that these deaths were likely to have been caused by several related and compounding factors resulting in low oxygen in the river: high temperatures and low or no water flow conditions led to thermal stratification and algal blooms; rainfall and an associated drop in temperature mixed the water layers, distributing very low dissolved oxygen throughout the water column; and high algal content in water releases from Lake Pamamaroo for stock and domestic flow, increased oxygen demand and consumption, which further reduced the dissolved oxygen available to fish. Read more: https://www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills/Fish-death-interim-investigation-report.pdf.

There are several rivers within the Murray-Darling Basin where there is 'High risk' or 'Extreme risk' of fish deaths occurring, including the Namoi, Lower Darling and Barwon-Darling Rivers: https://www.mdba.gov.au/sites/default/files/pubs/fish-deaths-summary-actions-risks.pdf.

While increasing water flow depends on good rainfall, people have been helping fish where they can. In several systems, aerators are being used to increase the level of dissolved oxygen in refuge areas (http://www.fishingworld.com.au/news/ozfish-install-aerators-near-menindee). This has been used before (for example, in the Murray River in 2016: http://news.csu.edu.au/opinion/creating-refuges-to-save-native-fish) and aeration devices are in place at priority refuge locations along the Lower Darling River (https://www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills/Fish-death-interim-investigation-report.pdf p14). Some irrigators have reversed their small pumps to feed air into the Darling River (https://bdtruth.com.au/main/news/article/10476-Reverse-pumping-working.html).

Aerators, such as this one, are being used to get more oxygen into the water. Photo: OzFish Unlimited.

Some irrigators have reversed their pumps, creating localised areas with more dissolved oxygen and many fish are taking advantage. Photo: Sourced from https://bdtruth.com.au/main/news/article/10476-Reverse-pumping-working.html.

NSW DPI have also undertaken fish rescues in the Darling River immediately downstream of Weir 32. Relocating fish is not a preferred solution because of the additional pressure it places on already stressed fish; however, the decision was made to proceed with rescue efforts due to the need to cease flows below Weir 32. Twenty large Murray Cod were initially removed and transported back to the Narrandera Fisheries Centre to be used for future restocking efforts, ensuring the ongoing genetic and cultural connectivity of these fish with the existing populations in the river (https://www.dpi.nsw.gov.au/about-us/media-centre/releases/2019/fish-rescue-attempt-at-menindee-update). A second rescue effort saw nearly 80 native fish relocated, including Murray Cod, Silver Perch and Golden Perch. Nearly half of these fish were moved to a deeper pool downstream, while 20 Silver Perch and 20 Golden Perch were taken back to Narrandera Fisheries Centre to be used as broodstock for future restocking efforts (https://www.dpi.nsw.gov.au/about-us/media-centre/releases/2019/fish-rescued-at-menindee).

In Victoria, where native fish numbers have responded positively to years of effort to improve habitat (https://www.weeklytimesnow.com.au/news/national/native-fish-populations-on-the-rise-as-species-come-back-from-brink/news-story/4c8adff29515450c4403f77a45f8b907), in conjunction with targeted re-stocking and water for the environment, both agencies and fishers are monitoring the drying creeks (e.g. https://www.gbcma.vic.gov.au/news_events/dry-and-heat-affect-creeks.html). The work that has been done to re-snag and revegetate waterways, creating and linking together cooler, deeper pools is proving valuable for fish.

It is hoped that the recovery of otoliths (or 'ear-bones') from some of the Silver Perch, Golden Perch, and Murray Cod that died in the Lower Darling River will improve the understanding of these populations. From the otoliths, researchers will determine where these fish were spawned and how long they had been residents of the Lower Darling, providing important information on the recovery potential for the system, and associated management actions to enhance the recovery and protection of native fish in the region (https://www.dpi.nsw.gov.au/fishing/habitat/threats/fish-kills/Fish-death-interim-investigation-report.pdf p15).

Longer-term, continuing to improve fish passage, re-snagging rivers, addressing cold water pollution, actively managing flows within our rivers, (https://www.theland.com.au/story/5882560/how-to-save-fish-in-the-darling-river-without-more-water/; https://ozfish.org.au/more-fish-in-the-lower-murray-bring-back-the-running-river/), and re-instating coordinated activities based on science, (http://news.csu.edu.au/features/science/a-good-plan-to-help-darling-river-fish-recover-exists,-so-lets-get-on-withit), will improve the resilience of fish populations.

‘Larvae-dusting’ coral

A new technique has brought thousands of coral larvae to damaged sections of the Great Barrier Reef, Queensland. An underwater robot, ‘LarvalBot’, operates like an underwater crop duster, releasing the larvae onto damaged reef areas, allowing them to settle and over time develop into coral polyps or baby corals, while also ensuring existing coral was not disturbed. Read more: https://www.qut.edu.au/research/article?id=138933 or watch: https://www.youtube.com/watch?v=D1qtR2OAVDM&feature=youtu.be.

The LarvalBot in action, dispersing thousands of coral larvae. Photo: Queensland University of Technology.

Donated timber for fish habitat and erosion control

Erosion control works along reaches of the Ovens River and Deep Creek, north-east Victoria, are utilising timber from roadworks in nearby Wangaratta. Flooding in 2016 led to erosion issues and these works also fit in with ongoing fish habitat improvement activities. The timber has been installed in combination with rock armouring to maximise the structural integrity and protection of the bank whilst minimising environmental impacts. This arrangement also provides habitat for fish species such as the Murray Cod. The sites will also be revegetated to provide long term protection. Read more: https://www.necma.vic.gov.au/News-Events/News/ArtMID/431/ArticleID/466/Erosion-Control-Works-Along-Ovens-River-and-Deep-Creek.

The placement of timber and rocks for erosion control and fish habitat will be complemented by riparian revegetation. Photo: North-east Catchment Management Authority.

Murray Crays taken for a ride

Over the past two years, 400 Murray Crays have been driven 200 kilometres by car then released back into the Murray River further downstream, achieving in a few hours what would have taken them 20 to 40 years to do naturally – by walking. The population of Murray Crays suffered in the 2010-2011 floods when thousands walked out of the water due to a lack of oxygen and died in the extreme heat. While there has been some natural recovery since 2010-11, it has been slow as the Crays tend to disperse their eggs within a localised area. Read more: https://www.abc.net.au/news/2018-12-11/murray-crayfish-relocated-to-boost-declining-population/10598410.

This female Murray Cray, with eggs, suffered no ill effects from her road trip and was released to rebuild the Cray population. Photo: NSW DPI.

Clearing the way for riparian revegetation along the Kiewa River

Stretches of Black Willow and Crack Willow have been removed from the banks – and in-stream – of the Kiewa River in north-east Victoria. The highly invasive plants have been collapsing into the river, creating blockages to flows and creating erosion issues. Read more: https://www.necma.vic.gov.au/News-Events/News/ArtMID/431/ArticleID/457/Working-Together-to-Improve-Our-Rivers.

From degraded dairy farm to fish food factory

A degraded dairy farm has been transformed into a thriving coastal wetland on the lower Macleay River estuary at South West Rocks, on the NSW north coast. The Boyters Lane Wetland Rehabilitation Project was recognised with the 'Natural Environment Protection and Enhancement: On-Ground Works' award at the NSW Local Government Excellence in Environment Awards. The 25-hectare site was assessed as 'severely degraded' in 2002. Extensive rehabilitation began in 2005 and included planting more than 15,000 native trees and shrubs, protecting and improving eight hectares of mangrove and saltmarsh. The wetland is now providing an important fish nursery for estuarine species within the broader Macleay River system. More: http://www.kempsey.nsw.gov.au/media-releases/2018/mr20181206.html.

Deep-water seagrass discovery

The world's largest meadow of carbon-absorbing deep-water seagrass - equivalent to the size of Switzerland – has been found around Lizard Island, within the Great Barrier Reef lagoon, Queensland. The find was a surprise as the area was thought to be just sandy substrate. Less well understood that shallow-water seagrass, these plants have been found to be resilient, efficient at capturing carbon and providing habitat for fish and other aquatic animals. More: https://www.sbs.com.au/news/the-discovery-giving-the-great-barrier-reef-a-fighting-chance.

More habitat for Marron

Smooth Marron in preferred habitat. Photo source from: www.mandurahmail.com.au.

The lower Harvey River in south-west Western Australia is heavily modified and environmental pressures, including the loss of riparian vegetation, increasing salinity, climate change and reduced river flow, has seen the range and number of both Smooth Marron and native freshwater fish reduced. Changes in irrigation practices have provided the opportunity to restore the deep refuge pools with a variety of vegetation preferred by Marron and Spring surveys revealed there are still thousands of juvenile native fishes in certain sites. While unlikely to survive in those habitats in summer as they are very shallow and devoid of complex habitat, the work has identified key areas to focus on to create permanent refuge pools and restore the vegetation along the river banks. More: https://www.murdoch.edu.au/news/articles/river-restoration-to-boost-marron-numbers.

Living seawalls for Sydney

An area of seawall with the tiles installed. Photo: Hollie Adams.

Five sandstone walls within the Sydney Harbour foreshore have been fitted with specially designed tiles to create habitat for oysters, fish, mussels and algae. Over 500 tiles were used across the sites. Most of the modification to the harbour shoreline is seawall and their relatively flat, featureless surfaces typically support lower biodiversity compared to the natural habitats they replace. The tiles are designed to both increase the surface area of the seawall and make it more complex. More:

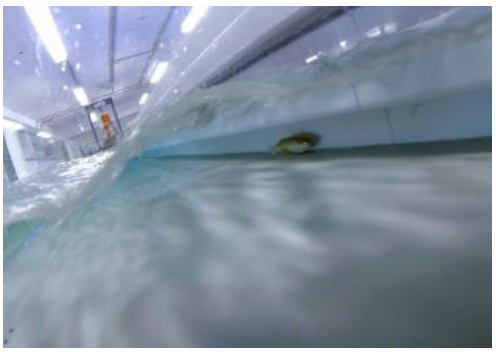
https://engonetsims.blob.core.windows.net/assets/uploads/files/Media/living%20seawallls_australia.pdf.

Searching for Kelp that tolerates warmer water

Kelp forests support many species of fish, as well as shellfish, lobster and abalone. The cooler water kelp forests support a significant component of Australia's fisheries and is estimated to be worth over $10bn to the Australian economy. Photo: Joanna Smart.

Adult Giant kelp have been found to engineer their environment to reduce water flow, sedimentation and light penetration, creating favourable conditions for juvenile kelp. When environmental pressures lead to the kelp forest becoming patchy, these plants are less able to modify their environment and the juvenile kelp don't do as well. The Giant kelp forests that once dominated the east coast of Tasmania have been reduced top 5 percent of their former extant over the past few decades. This remnant appears to be quite healthy and researchers are studying them to see if they represent genotypes or populations that have just been naturally selected to be more tolerant of warmer waters. Read a summary of this research: https://www.abc.net.au/news/2019-02-06/scientists-in-race-to-save-giant-kelp-off-tasmanian-coast/10782410 or the article by Layton and others in PLOS ONE: https://doi.org/10.1371/journal.pone.0210220 [Open access].

Simple improvement to culvert design benefits fish



A Crimson-spotted rainbowfish navigates the fast flow by swimming in the slower water under the beam. A square beam installed along the length of a culvert wall can be incorporated into new structures and or retrofitted into existing culverts. Photo: Harriet Goodrich.

Improvements to culvert design have helped reduce the barriers to fish movement in waterways, however small fish can still struggle. Scientists have taken advantage of a property of fluid mechanics known as the 'boundary layer' – a thin layer of slower-moving water that occurs when the water moving over a solid surface is slowed by friction. The area can be quite small but little fish can still use it and are very good at finding it. By adding a square beam running the length of the culvert wall, close to the floor, a reduced velocity channel is created along the side of the main flow. Testing found that water velocity in the zone below the beam was slowed by up to 30%. For small fish, this is a huge reduction. Every species tested saw significant improvements in their ability to swim and traverse up the channel, regardless of their body shape or swimming style. Read a summary (with video of fish using the boundary layer effect): https://theconversation.com/how-did-the-fish-cross-the-road-our-invention-helps-them-get-to-the-other-side-of-a-culvert-103433 or read the article by Watson and others in *Ecological Engineering*: https://doi.org/10.1016/j.ecoleng.2018.08.008.

Blackfish back in King River habitat

Victoria's King River is seeing the return of many fish species, including River Blackfish and Murray Cod, on the back of a four-year fish habitat enhancement project. The project included the placement of more than 60 large granite boulders, creation of log jams, and planting of more than 250 hardwood trees and 750 native trees and shrubs. The combination of log jams and rock seeding provide changes to water flows in this fast-moving river. Over time, the build-up of debris in the log jams will increase their effectiveness. More: https://www.vrfish.com.au/2019/01/21/habitat-success-in-king-river/.

INTERNATIONAL NEWS

Tumour-free Flounder thanks to Boston Harbour clean-up

By the mid-20th century, heavy loads of pesticides, PCBs, heavy metals and the outfall of largely untreated sewage and sludge from two overloaded treatment plants flowed into Boston Harbour, Massachusetts, USA. The harbour was a mecca for recreational Flounder fishing, even at its dirtiest in the 1970s and 1980s and despite the presence of tumours on the fish. Scientists monitoring the fish since 1987 and measuring the effects of clean-up efforts that began in the 1990s have found that the prevalence of tumours in the fish declined with time, to the point where none were detected after 2004. The levels of persistent toxic chemicals in Flounder, effluent, and sediment have also decreased. It is estimated that Boston Harbour now provides a capital value of US$30 billion to US$100 billion in ecosystem services, such as recreation opportunities and habitat for fish and shellfish, thanks to a clean-up with a total price tag of $4.7 billion. Read more: https://theconversation.com/tumor-free-flounder-are-just-1-dividend-from-the-cleanup-of-boston-harbor-109217 or the research by Moore and others in *Diseases of Aquatic Organisms*: https://doi.org/10.3354/dao03299.

Fish migration and European Rivers

A review of the accessibility of European rivers for migratory fish species has showed that only very few rivers are still unaffected by dams in the main stem and that the few remaining viable migratory fish populations in Europe occur in these accessible rivers. The effect of river damming on migratory fish was quantified for all 16 European long- and mid-distance anadromous fish species and for 33 large European rivers comparing historical and current distribution. Many rivers are now devoid of any migratory fish species, with the loss of coinciding with a strong decrease in accessibility. Currently, only two European rivers are free flowing to the sea, the Torneälven and the Odra. Historically, the Rhine River had the largest number of migratory species and it is still accessible for 76%, covering the main river migration route to 71% of the spawning areas. Read more of this review by van Puijenbroek and others in *River Research and Applications*: https://doi.org/10.1002/rra.3386 [Open access].

Cattle grazing and fish recovery

Steelhead Trout are one of species that benefit from new approaches to grazing management. Photo: T. Sedell.

The application of social–ecological systems science in the Blue Mountains of eastern Oregon, USA, is finding ways to address rangeland management challenges associated with the survival and recovery of fish species on land where cattle grazing is a dominant type of land use. The impacts of grazing in riparian areas have been a focal point of the controversy, however, unmanaged grazing can have deleterious effects on riparian and aquatic ecosystems and fish. While changing grazing systems effects the impacts of grazing on riparian areas, the long-term work between researchers, managers and ranchers has found that improving the compatibility of cattle grazing and fish recovery also calls for the development and application of promising innovations, and overcoming barriers such as absence of trust, the use of litigation as a stopgap, and the lack of flexibility to experiment and implement adaptive management. More on this work by Charnley and others in the *Journal of the Ecological Society of America*: https://doi.org/10.1002/fee.1751 [Open access].

Growing coral and seagrass

In the Gulf of Mannar, on the south-east coast of India, low-tech and low-cost coral and seagrass transplantation techniques have been implemented successfully. The rehabilitation of coral commenced in 2002, and of seagrass in 2008. Coral survival is 80 percent, with an average annual growth of 13.5 cm in fast-growing branching corals and 1.8 cm in massive corals. There was also in increase in associated fish population. Likewise, biodiversity has improved in the areas of rehabilitated seagrass. Read more of this work by Patterson Edward in the *International Journal of Environment and Sustainability*: https://www.sciencetarget.com/Journal/index.php/IJES/article/view/912 [Open access].

Coral transplantation onto a 'fish house' formed part of the rehabilitation project. Photo: J.K Patterson Edward.

The ***Reef Futures Symposium 2018*** covered a range of topics relevant to the restoration of reefs worldwide (https://www.fisheries.noaa.gov/feature-story/reef-futures-2018-symposium-renewed-hope-coral-reefs-around-world), including the release of the *Coral Reef Interventions Research Review*. This report reviews the coral genetic, ecological, and environmental intervention strategies known to-date. Each intervention type is summarized with a brief description, benefits and goals, implementation, current feasibility, scale of application, risks, limitations, and infrastructure needs. More: http://dels.nas.edu/Study-In-Progress/Interventions-Increase-Resilience/DELS-OSB-17-01.

The Hudson River: highly urbanised, lots of fish

The Hudson-Raritan Estuary, New York, USA, an interconnected ecosystem of tidal rivers, tidal straits and bays, hosts one of the most urbanised regions in the world. Centuries of development resulted in habitat loss, poor water quality, reduced wildlife, and contamination. Over the last several decades, a variety of pollution-reduction programs have been implemented and improved the estuary. It is now home to over 200 species of fish and serves as a passageway for species migrating between rivers and the ocean. There are still ongoing issues, including toxic pollution from many historic hazardous waste sites that continue to contaminate the waterways and fish. More: https://blog.response.restoration.noaa.gov/spotlight-northeast-hudson-raritan-estuary-urban-ecosystem-rebound.

Ongoing work in the Hudson River catchments includes improving culverts, removing barriers and working with local authorities to improve fish access without compromising flood mitigation. For example, stream barriers in eastern New York were removed, allowing native Brook Trout to access miles of cold-water habitat. One of these culverts had collapsed at a crossing, damming the creek and creating a large wetland upstream. Because the culvert was buried under several hundred cubic yards of fill, removing it was no small task. More: https://www.tu.org/blog-posts/new-york-volunteers-spearhead-barrier-removal-projects.

Assessments of culverts across the Hudson River catchments is helping local authorities improve local road infrastructure while at the same time reducing stream habitat fragmentation. Photo: https://www.tu.org/blog-posts/tu-works-in-new-york-to-improve-habitat-boost-flood-resiliency.

Salmon return to the Don

Multiple adult salmon have been found in the River Don, Sheffield, England, for the first time in 150 years and they also appear to have spawned. Whether the conditions will be right for their young to survive and thrive is, however, unknown. The fish follows improvements to water quality and the construction of fish passes. Growth patterns in the scales on a female fish showed it had spent two years in freshwater before spending two years at sea. Most Salmon return home to the river where they were born, but some will stray up the 'wrong' river. This is how they can recolonise rivers where they may have become locally extinct, such as the River Don. More: https://www.gov.uk/government/news/salmon-found-in-river-don-at-sheffield.

One of the fishways ('fish passes') that is enabling Salmon to find their way upstream in the River Don. Photo: Don Catchment Rivers Trust.

More habitat access in Michigan

Five culvert improvement projects on trout streams in Northern Michigan, USA, have reconnected more than 19 miles of high-quality habitat. One of the projects, on Big Cannon Creek, a tributary to the Upper Manistee River, saw the replacement of two 3 foot by 5-foot corrugated metal culverts that sped up the river current and had created a headwall. A natural channel bed was constructed to mimic natural stream conditions through the culvert. The replacement of the culverts opened approximately 8 miles of upstream high-quality cold-water habitat for Trout and other fish. More: https://www.tu.org/blog-posts/new-culvert-opens-habitat-on-big-cannon-creek-in-michigan.

Before (left) and after (right) work on Big Cannon Creek restored access to high quality habitat. Photo: Trout Unlimited.

White-claw Crayfish given emergency housing

White-clawed crayfish were once common throughout much of lowland Derbyshire and Staffordshire, England. They are now Endangered and the serious decline in population throughout their range is largely due to the spread of the introduced Signal Crayfish and the disease it carries. Until a way of controlling the pests is found, a stopgap solution is to re-locate White-claws to 15 'ark sites': streams or ponds where it is virtually impossible for Signal Crayfish to reach. Ark sites are assessed carefully before any re-location occurs. Habitat at the sites was augmented with the creation 30 crayfish 'safe houses': a collection of house bricks with large holes, with a cap stone to add stability and shade. More: https://www.derbyshirelife.co.uk/out-about/wildlife/the-crayfish-in-crisis-project-1-5887475.

RESOURCES

Proceedings: National Summit on Coastal and Estuarine Restoration and Management

The proceedings of the *9th National Summit on Coastal and Estuarine Restoration and Management: Investing in Our Coasts: Environment, Economy, Culture*, 2018 are available here: https://blog.estuaries.org/summit/program-information/2018-proceedings/ and posters here: https://blog.estuaries.org/summit/program-information/2018-posters/. A program of the Summit with presenters' names here: http://blog.estuaries.org/wp-content/uploads/2019/01/2018-Summit-Program.pdf.

Special Issue: *Marine and Freshwater Research*: Hydropower and Fish Management Symposium

This issue of *Marine and Freshwater Research* includes papers for the 1st International Symposium on Hydropower and Fish Management held in December 2018: https://www.publish.csiro.au/MF/issue/8789/.

Note: Papers from the *International Conference on Engineering & Ecohydrology for Fish Passage* will be available here: https://scholarworks.umass.edu/fishpassage_conference/.

Introduction to shellfish reef restoration

An overview of how shellfish reefs work and the rationale for their restoration: https://www.youtube.com/watch?v=Dn8dZrWK7fM&feature=youtu.be

Coastal Wetlands: An Integrated and Ecosystem Approach

Second Edition: this book provides an understanding of the functioning of coastal ecosystems and the ecological services that they provide. Links to summaries of chapters: https://www.sciencedirect.com/book/9780444638939/coastal-wetlands#book-description.

Coral Reef Interventions Research Review

This report reviews all current coral genetic, ecological, and environmental intervention strategies. Each intervention type is summarized with a brief description, benefits and goals, implementation, current feasibility, scale of application, risks, limitations, and infrastructure needs: http://dels.nas.edu/Study-In-Progress/Interventions-Increase-Resilience/DELS-OSB-17-01.

About Newstreams

Newstreams is an email newsletter to keep people up to date about fish habitat activities and important developments in fish ecology and habitat. It is free by email subscription.

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You can send in your habitat news by emailing the editor, Liz Baker.

Back issues can be accessed from http://www.fishhabitatnetwork.com.au/archive.

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Recreational Fishing Trusts

NSW GOVERNMENT Department of Primary Industries

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Amateur Fishing Association of the Northern Territory (AFANT) http://afant.com.au/

Australian Fishing Trades Association http://afta.net.au

Australian National Sportfishing Association - NSW www.ansansw.com.au

Capital Region Fishing Alliance http://crfa.org.au/

Fisheries NSW www.dpi.nsw.gov.au/fisheries/habitat

Freshwater Fishing & Stocking Association of Queensland (FFSAQ) www.ffsaq.com.au

NSW Council of Freshwater Anglers www.freshwateranglers.com.au

NSW Fishing Clubs Association www.nswfca.com.au

OzFish Unlimited http://www.ozfish.org.au

PIRSA Fisheries and Aquaculture www.pir.sa.gov.au/fisheries

Recfish Australia http://recfishaustralia.org.au/

RecfishSA www.recfishsa.com.au

RecfishWest www.recfishwest.org.au

Recreational Fishing Alliance of NSW www.rfansw.com.au

SUNFISH www.sunfishqld.com.au

Sweetwaterfishing http://www.sweetwaterfishing.com.au

Victorian Dept of Environment, Land, Water and Planning (DELWP) www.delwp.vic.gov.au

Victorian Fisheries Authority: https://vfa.vic.gov.au

VRFish www.vrfish.com.au

Western Australia Department of Fisheries: www.fish.wa.gov.au/Pages/Home.aspx