#54, March 2016

Newstreams

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

AUSTRALIAN NEWS

Fish go with the flow …

In rivers where flows are intermittent, fish have to rely on isolated waterholes to survive. Researchers studied how and where Bony Bream, Eel-tailed Catfish and Golden Perch moved in response to brief flow events in the Moonie River, part of Murray-Darling Basin in Queensland. Over three years, the researchers tagged 215 fish and they found that when flow events occurred, individuals from each species moved from their waterhole but showed no preference for upstream and downstream. Most travelled up to 20km in a few days, however many fish later returned to their starting waterhole. For more on this research by Marshall and others in *Freshwater Biology*: http://dx.doi.org/10.1111/fwb.12707

… and spawn

Golden Perch and Silver Perch in the Goulburn River, Victoria, have shown a strong spawning response to increased flows. Monitoring of an environmental water delivery in Spring 2014 found that both species responded to the flow pulse by spawning in numbers not seen except following the 2010 floods. However, follow-up monitoring in 2015 did not find any young-of-year. It appears that spawning does not necessarily mean recruitment of juveniles in the same area of the river. Golden Perch and Silver Perch both have semi-buoyant eggs which drift downstream so it is possible that the juveniles are now in the Murray River. For more information: http://www.environment.gov.au/system/files/resources/f06598f9-e53f-4d45-95e3-7be3faad403a/files/wa28-chapter-4.pdf [scroll to page 12]

Some of the record number of Golden Perch eggs that resulted from the spawning response to environmental water flow. Photo: Jim Castles

… but not all in the same place

The fish habitat of more than 1100km of the Barwon-Darling Rivers between Walgett and Wilcannia, New South Wales, has been mapped. River bank shape and depth, vegetation and river snags were all noted because these effect how different species of fish use various areas of the river and how they respond to flows. Some native fish need deeper, faster flowing water to breed, while others prefer to lay their eggs on vegetation in the calmer waters of a wetland. More information: http://www.mdba.gov.au/news/fish-fancy-flows-0

… and not just freshwater fish

Freshwater flows are important for the spawning and recruitment success of several estuary fish species, including Mulloway, Estuary Perch and Dusky Flathead. There is a strong correlation between good recruitment in an age class and high freshwater flows during the previous breeding season, especially in the estuaries of highly regulated rivers. For an overview: http://flickandflyjournal.com/2016/02/16/why-mulloway-fishermen-should-care-about-freshwater-inflows/

‘You can’t put a value on that’

Old family photos tell the story of what previous generations of fish were like. Image: extracted from video.

This is what sugar cane farmer, Vince Papale, says about the wetland he and his family have restored on their farm. In 8 years the unproductive area on his farm in Queensland’s Burdekin region has been transformed into a thriving wetland, complete with many species of fish. Vince did not set out to be a ‘fish-friendly farmer’, but he has become one and he feels good about that. As well as enjoying being able to get away from farming and have a fish without leaving the farm, he also enjoys knowing that during the Wet, his wetland will contribute more fish back into the local waterways. For more on this story: https://www.youtube.com/watch?v=ydPuXKE7_jE&feature=youtu.be

Remote habitat reveals new fish

Twenty new freshwater fish species were found when researchers sampled 17 rivers in the remote, arid Kimberley region of north-western Australia. 16 news species of Grunters, one of which was 25cm long, as well as three new Gudgeons and one new Hardyhead were found. Many of the new species were limited to just one catchment, making them vulnerable to changes in their habitat. Read more about this work by Le Feuvre and others in *Global Ecology and Biogeography* at http://dx.doi.org/10.1111/geb.12397 or a summary at https://www.sciencedaily.com/releases/2016/01/160106110713.htm

Feral focus in WA

With a sample of water, researchers are able to tell which species are present from the DNA they leave behind. Photo: Edith Cowan University.

Pest ornamental fish are now the majority of fish in many of the metropolitan freshwater lakes in Perth, Western Australia. Researchers have found that using a forensic method known as Environmental DNA (‘eDNA’) to detect these fish is easier, less resource intensive and just as effective as sampling and trapping. eDNA works by detecting the DNA, which is unique to each species, that is shed by the fish as skin or waste products. As little as a glass of water from a lake is enough to be able to detect which fish species are present. However, public reporting and sightings remain critical to tracking the distribution of the pest fish. To read more: http://www.fish.wa.gov.au/About-Us/News/Pages/CSI-for-feral-fish.aspx

Fish barcoding

Researchers, based in New South Wales, are using the eDNA technique to build up a library of DNA ‘barcodes’ for aquatic species. This will help future researchers use this technique to identify what fish are present with just a water sample. For more: http://www.abc.net.au/news/2015-12-22/dna-research-allows-scientists-to-genetically-test-waterways/7048490

What do fishing competitions and snags have in common?

For the fish in the Macquarie River, central New South Wales, the answer is that the local fishers are using one to provide the other. Recognising the massive reduction in fish populations was at least partly related to the loss of snags, the Inland Waterways Rejuvenation Association is using funds collected from its Lake Burrendong Fishing Classic to re-snag the river. For more: https://www.facebook.com/matthew.hansen.31521301/videos/956058711108234/?fref=nf

Carping on

Juvenile carp aggregated below the Menindee Main Weir on the Darling River. Image: Nigel Harriss.

The impact of European Carp on native fish and waterway health has been well documented. One of the options being explored to manage Carp populations in Australia is the introduction of Cyprinid herpesvirus 3, more commonly known as Carp Herpesvirus. CSIRO are investigating the potential of the virus and have put together a summary of the issues associated with Carp and the introduction of a biocontrol agent (https://blog.csiro.au/reclaiming-our-rivers-from-feral-carp/). Other resources discussing the issues are a video (https://au.prime7.yahoo.com/v1/news/a/-/local/30583931/virus-to-help-control-carp-video/) and overview articles (https://theconversation.com/we-could-reduce-pest-carp-in-australian-rivers-using-a-disease-that-came-from-israel-53492 and http://www.theaustralian.com.au/news/inquirer/european-carp-public-enemy-no-1-in-the-murraydarling-basin/news-story/1e1c77892fa7f8dafc1cca6ddc1daac5).

Understanding the fish moves

Fish capacity to move within waterways is known to be important for accessing spawning and feeding habitats, and different species migrate at different times and in response to different cues. Researchers tracked radio-tagged fish over several years to examine movement patterns in the Murray River, south-eastern Australia. Three native fish species, Murray Cod, Trout Cod, Golden Perch, and the pest species, European Carp, were studied. The predominant movements for all the species studied were less than 1 km. Trout Cod were found to move the least, with 75 percent moving less than 25 metres. Golden Perch showed greater variation in movement and a maximum distance of 633 km was recorded. Murray Cod and Carp were the most mobile overall. All of the species were observed to use the floodplain and floodplain channels. For of this research by Koehn and Nichol in the *Journal of Fish Biology*: http://dx.doi.org/10.1111/jfb.12884 [Open access]

Wetland woes for 'hibernating' fish

Western Australia is home to two species of fish that aestivate, which is like a summer-time hibernation in that the fish burrow into the ground and become dormant over summer. However, populations of the Salamanderfish and Black Stripe Minnow have been dramatically reduced as the wetlands they call home dry out. As well as a dry summer, remnant wetland habitat is being threatened by stock access and water regulation. Historical records indicate that the Salamanderfish has been lost from 80 percent of their range. For more: http://www.abc.net.au/news/2016-02-15/extinction-fears-for-south-west-wa's-'hibernating'-fish/7168584

Warming the water

A thermal curtain directs warmer surface water to the tower outlet. Photo: Guresh Ahuja.

The thermal curtain in Burrendong Dam on the Macquarie River, central New South Wales, appears to be reducing the cold water pollution associated with water releases. The thermal curtain is a cylinder that gets raised and lowered in order to divert warm water into the dam outlet below. Researchers monitoring the impact of the thermal curtain have measured improvements in temperature averaging about 2.5 degrees. This is sufficient to influence native fish spawning opportunities downstream. For more on this ongoing research:
http://newsroom.uts.edu.au/news/2015/09/happier-environment-fish

Last oysters providing answers

Researchers are looking to the Georges Bay population of Angassi, or Flat Oysters, on Tasmania's east coast, for answers that will assist with the shell reef restoration projects underway in Victoria's Port Philip Bay and South Australia's Gulf of St Vincent. This site appears to be the only surviving flat oyster reef in the country and is proving to be a valuable reference point for the restoration projects. To read more: http://www.abc.net.au/news/2016-01-06/angasi-oyster-reef-research-restoration/7068628

Georges Bay Flat Oysters are the reference point for restoration efforts elsewhere. Photo: Chris Gillies

Living with low oxygen

'Hypoxia', or low oxygen, is a problem for fish and hypoxic conditions contribute to the fish kills seen in both freshwater and estuarine environments. Researchers are looking at how Barramundi cope with low oxygen environments and whether they can adapt to them. Fish aged between 4 and 6 months are placed within a machine which measures the oxygen consumption rate of the fish. The dissolved oxygen level in the water is reduced gradually to the point where fish experiences severe hypoxic stress. To listen to an interview about this research and its findings: http://www.abc.net.au/radionational/programs/scienceshow/assessing-the-vulnerability-of-fish-to-an-increasingly-hypoxic/7144570

In related research, a study has found the human activities are increasing the number and frequency of hypoxic conditions in freshwater lakes around the world. Researchers analysed the onset and duration of hypoxia since AD 1700 as recorded in the sediments for 365 lakes worldwide. The lakes are located in a variety of climates and experience different levels of human impact. Around 20 percent have shifted to hypoxic conditions since the middle of the 19th century. The study also showed that while aquatic rehabilitation programs in some countries have succeeded in reducing the influx of nutrients to lakes and the subsequent eutrophication that can lead to fish kills, such projects have failed so far to return lake bottoms to their original well-oxygenated status. For more on this research by Jenny and others in *Global Change Biology*: http://dx.doi.org/10.1111/gcb.13193 or for a summary: https://www.sciencedaily.com/releases/2016/01/160106114708.htm.

Fish benefits flow from Australia to Laos

Scientists from Australia and Laos have been working together to improve fish habitat, particularly in relation to the design and operation of fishways on the Mekong River, Laos. The Lao Irrigation Department has now completed 11 fish passage facilities at weirs in southern Lao, using the expertise gained from fishway projects in the Murray-Darling Basin. The project report is available by going to http://aciar.gov.au/publication/fr2016-01.

Before (left) and after (right) the construction of the fishway on a tributary of the Mekong River, Laos. Photo: ACIAR

INTERNATIONAL NEWS

Tracking the benefits of habitat restoration for fish

Juvenile Coho Salmon survival was found to have increased 50 percent in summer and 300 percent in the winter after restoration improved rearing habitat. Photo: www.nwfsc.noaa.gov

'Intensively Monitored Watersheds' is an approach using technology to track how fish at all life stages are responding to stream restoration over time. It provides researchers with sufficient detail over longer timeframes to enable them to identify whether fish populations are increasing and whether this is due to the improvements in the habitat. Researchers used this approach in 17 watersheds in the USA Pacific Northwest to see how various species of Salmon are responding to habitat restoration. Their findings from various sites include a 250 percent increase in numbers of juvenile fish in areas with restored habitat compared to those without; a 400 to 800 percent increase in fish numbers in response to the reconnection of side channels; and a 175 percent increase in juvenile Steelhead in response to reduced erosion and a higher water table. They have also identified Coho Salmon migration patterns that have implications for the resilience of local populations of this species. Read more of this work by Bennett and others in *Fisheries*, http://dx.doi.org/10.1080/03632415.2015.1127805 or a summary, https://www.sciencedaily.com/releases/2016/02/160201104034.htm.

Fish are the best critics

Salmon returned to the Little Wind River, Washington State, USA, within two weeks of habitat restoration being completed and the river flowing freely. The restoration involved rebuilding the stream bed, reintroducing riffles and deep pools of slow moving water. Despite there being very few fish in the river for decades, hundreds are now returning to spawn. For more on this story and interviews with those involved: https://www.youtube.com/watch?v=p3zBr8hA6hc

Access after 150 years

The new 350m rock ramp fishway lets fish access habitat upstream of Frankenmuth Dam for the first time in 150 years. Photo: U.S. Army Corps of Engineers

The U.S. Army Corps of Engineers has completed the Frankenmuth Dam fish passage project, located in the Great Lakes area of Michigan, USA. Fish can now access spawning habitat that had been unreachable since the dam was originally constructed more than 150 years ago. The fishway is a rock ramp, constructed along a 350 foot (about 106m) section of the river adjacent to and downstream from the dam and consists of over 14 structures, including resting pools. Walleye and Lake Sturgeon are two of the fish species expected to take advantage of the new habitat. For more: https://www.youtube.com/watch?v=h6tDwaWnMSQ

Slea restoration in progress

A working bee as part of the River Slea restoration project, Lincolnshire, UK, saw volunteers happy with a day's efforts to reinstate structure in the river. The work is one of the activities associated with the restoration of a 1.5km stretch of the Slea upstream of Sleaford. To see what they achieved that day: https://www.facebook.com/463959343699189/videos/1005178859577232/?fref=nf

Dam poor outcomes for fish

A group of 40 international scientists have summarised the negative impacts of hydroelectric development on fish diversity and ecosystems of the Amazon, Congo and Mekong Rivers. These three rivers hold roughly one-third of the world's freshwater fish species, and the Amazon alone is home to 2300 known species. Until recently, the dams on these rivers were relatively small and on upland tributaries. However, the scientists are concerned that the additional 450 dams planned or under construction are likely to have dramatic impacts on fish and on fisheries. A core element of their concern relates to the fact that dams block fish migrations and all three rivers boast economically important species that are strongly migratory. To read more on this work by Winemiller and others in *Science*: http://dx.doi.org/10.1126/science.aac7082 or for a summary: https://www.sciencedaily.com/releases/2016/01/160107184959.htm

Canal habitat

Canal vegetation can provide important fish habitat. Photo: canalrivertrust.org.uk

As engineered and often working environments, canals are not necessarily thought of in terms of the habitat they might provide for fish. However, the vegetation associated with canals can provide opportunities for different species of fish at different life stages in what is otherwise a habitat-poor environment. While not diverse, canal vegetation can range from fully submerged plant species to those with floating leaves, such as lilies, stands of reeds and rushes, and underwater tree roots as well as boughs dipping into the water. Read more about canals as fish habitat: https://canalrivertrust.org.uk/news-and-views/blogs/the-fisheries-and-angling-team/the-importance-of-vegetation-for-fish-in-canals

The tale of the Taff

The River Taff in Wales was once so polluted by heavy industry that there were no longer fish living in it. It is now one of the best Salmon and Trout rivers in Wales. This 3-part documentary by the BBC tells the story of the recovery of the River Taff: http://www.bbc.co.uk/programmes/b0701s43.

Songbird tells the fish story

A healthy American Dipper tells the story of the return of the Salmon. Photo: Ohio State University

The American Dipper is a songbird that flourishes where rivers are rich in Salmon. Where dams restrict fish, it struggles. Researchers have found that when natural flows are restored, the health of these birds and their breeding success are indicators that the fish have returned. The American dipper feeds by diving below the river's surface and walking the riverbed, feeding on aquatic insects and some small fish, including juvenile salmon. As the dams along the Elwha River, Washington State, were removed the researchers found an increase in salmon-derived nutrients in American Dippers almost as soon as the flow was restored. Read more about this work by Tonra and others: http://www.terradaily.com/reports/River_ecosystems_show_incredible_initial_recovery_after_dam_removal_999.html

The return of fish in the Elwha is notable in ways other than in relation to improving the American Dipper population. More than 4,000 Chinook spawners were counted above the former Elwha Dam the first season after it came down and overall, fish populations are the highest in 30 years. For more: http://projects.seattletimes.com/2016/elwha/?platform=hootsuite

Fishways help genetic exchange

Chub have not been stocked in Swiss waterways, enabling researchers to study how effective fishways are at helping fish from different populations mingle as they travel great distances during the spawning periods. An artificial barrier without fish ladders has as strong an effect on the genetic differentiation of fish as a distance of around 100 kilometres in a barrier-free river. They found that the fishways do help, and a barrier fitted with a fishway reduced the genetic differentiation of fish to the equivalent of a distance of around 12 kilometres in a barrier-free river. However, the effect of the barriers is not completely overcome. The design of the fishways was also important. Bypass channels proved more effective than simple concrete stairs. At one site with a naturally-structured bypass channel with a sizable flow around 40,000 fish of 33 different species used the fishway in one season. For more on this research by Gouskov and others in *Evolutionary Applications*: http://dx.doi.org/10.1111/eva.12339 or for a summary: https://www.sciencedaily.com/releases/2016/01/160106091508.htm.

Shady rewards

Fish such as Brook Trout and Golden Trout benefit from cooler water temperatures in the summer. Researchers looked at the impact of riparian vegetation on water temperature and on fish. They found that water temperatures approached the upper limit of tolerance for Golden Trout in some areas of suitable habitat but the water was cooler in ungrazed areas with trees. Riverbank vegetation was both larger and denser where livestock were not present. For more on this research by Nusslé and others in PLOS ONE: http://dx.doi.org/10.1371/journal.pone.0142426 or for a summary: https://www.sciencedaily.com/releases/2016/01/160114113645.htm

Overhanging trees and vegetated banks make this an ideal stream for helping trout cope with high summer temperatures. Photo: www.flyfisherman.com

In related work, a 15-year study of factors affecting populations of Eastern Brook Trout showed high summer air temperatures are a critical problem, in particular for the smallest fry and eggs. The researchers sampled populations and tagged individual fish to understand the relationship between fish deaths, births, their movement into and out of the stream and factors such as air and water temperature, stream flow, rainfall and drought by season. They found that about 90 percent of the yearly variation in abundance was due to high summer temperatures. The study suggests that putting more shade-producing trees along river banks, adding logs into streams and making sure there are not too many wells removing cold spring water from the watershed will help reduce the impact of summer air temperature on water temperature and therefore on fish. For more on this work by Bassar and others in *Global Change Biology*: http://dx.doi.org/10.1111/gcb.13135 or for summary: https://www.sciencedaily.com/releases/2015/11/151130182518.htm

Hope in the face of Steelhead decline

The Russian River, on the north-west coast of the USA, was once a prime Steelhead fishery. A passionate Steelhead fisher and conservationist documents its decline in a review article, listing four ‘Hs’ as causes: harvest, hatcheries, hydropower and habitat, the last of which is argued as being the most important. The destruction of Russian River habitat is described as four ‘Ds’: diversions, dredging, deforestation and development. The ‘hope’ aspect comes from the activities of passionate fishers and organisations. One project is focussing on reinstating the Russian River floodplains, slowing floodwaters down and enabling the aquifers to fill, which, in turn, ensures steady flow into the river once the flood is over. To read the review: http://www.wildsteelheaders.org/russian-river-hope/ or more about the re-flooding project: http://madelocalmagazine.com/2015/09/sinking-in/

The rain in Spain flows (more) freely down the plain

Spain is ensuring healthier rivers and fish populations with the implementation of the *National Strategy for the Restoration of Rivers*. The removal of redundant structures often requires serious engineering to enable machinery access to both the river and the dam walls. For some examples (in English): https://www.youtube.com/watch?v=Gvr4WXH9Sd0; https://www.youtube.com/watch?v=OnxMQwcMgjQ; https://www.youtube.com/watch?v=o_2FYWiNAXU; https://www.youtube.com/watch?v=heRW39xP02Q.

Where are the Mussels?

Scientists from 26 European countries have compiled the first comprehensive survey on the status of freshwater Mussel species in Europe. Some species of Mussel live for over a century and individuals filter up to 40 litres of water per day, having a major influence on the water quality as a result. The study found difference in species composition and abundance between southern and northern Europe, as well as a wide range of habitat use. The main threats to Mussels are barriers, water quality and habitat changes affecting their fish hosts. As larva, Mussels rely on specific species of fish as hosts. The larva attach to the gills of a fish, growing in this oxygen-rich environment for several months before dropping off and settling. For more on this study by Lopes-Lima and others in *Biological Reviews*: http://dx.doi.org/10.1111/brv.12244 or a summary: https://www.sciencedaily.com/releases/2016/01/160108134223.htm.

A group of freshwater Pearl Mussels in a riverbed in Sweden. These Mussels can live to be 130 years old. Photo: I Boldie, CC BY-SA 3.0 httpscommons.wikimedia.orgwindex.phpcurid=2387244

62 fewer barriers for fish

62 dams were removed in the USA in 2015, restoring more than 570 miles of waterways for the benefit of fish. The removals occurred across 21 states, with 23 gone in Pennsylvania alone. To read highlights and access an interactive map that includes all known dam removals in the USA as far back as 1916 (www.AmericanRivers.org/DamRemovalsMap) go to: http://www.americanrivers.org/blog/62-dams-removed-in-2015.

RESOURCES

First Global Integrated Marine Assessment

In December 2015, the United Nations General Assembly adopted resolution 70/235 on *Oceans and the law of the sea*, welcoming the first global integrated marine assessment. http://www.un.org/depts/los/global_reporting/WOA_RegProcess.htm

Reef fish spawning habitats

Laurent Chérubin, of the FAU Harbor Branch Oceanographic Institute, provides a lecture on the physical and ecological requirements for reef fish spawning habitat. https://www.youtube.com/watch?v=l3lKfoz8nDs

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.

To **subscribe** use the form.

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.

Newstreams is supported by funds from the NSW Recreational Fishing Trust, raised from the NSW Recreational Fishing Fee.

Newstreams is published electronically every three months by the Aquatic Habitat Rehabilitation Unit within Fisheries NSW on behalf of the Fish Habitat Network, a partnership of organisations working on fish habitat and a network of fishers engaged in fish habitat issues.

Recreational Fishing Trusts

NSW GOVERNMENT Department of Primary Industries

FISH HABITAT NETWORK

Website
www.fishhabitatnetwork.com.au

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Partners

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/

Ecofishers www.ecofishers.com

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

Fisheries Victoria www.dpi.vic.gov.au/fisheries

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

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 Department of Environment and Primary Industries www.depi.vic.gov.au

VRFish www.vrfish.com.au

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