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Edgbaston Springs – just centimetres deep – are like watery islands in a sandy ocean and have been demonstrated to be the most ecologically diverse in Australia and are home to a unique Blue-eye. A.K.

Main features in this issue:

Female Kai Creek Freshwater Crab (see article page 816)
G.A.

Red-finned Blue-eye: The Story So Far

Adam Kerezsy

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Preamble

In late 2008 I was tearing my hair out trying to finalise a PhD on fish ecology in western Queensland. The field work over the preceding years had taken me all over the west – everywhere from the Bulloo River west of Charleville across to the remote Mulligan River on the edge of the Simpson Desert. Thousands of fishes, kilometres and conversations had to be squeezed into a sciency-sounding thesis, so my head was down, and to be honest the last thing on my mind was what to do after it was all over. From what I could tell there wasn't much call for an arid zone specialist in the fish world and in all likelihood I'd just return to my little hobby farm in western New South Wales with a couple of extra letters surrounding my name. But in the midst of all the papers and databases and computer glitches I received a call one day from a woman at an organisation called *Bush Heritage*. I'd heard of the organisation – in fact I'd sampled fishes on their desert properties – but I didn't know much about it apart from the fact that they bought properties and managed them for conservation outcomes. The phone call turned to the company's latest acquisition – a property called Edgbaston. I'd heard of it too, but again, that was about it. In the back of my mind I knew that ANGFA member Peter Unmack had found a weird little fish there some 20 years earlier. It turned out that the fish, and the little springs in which it lived, were what the phone call was actually about – I'd been recommended to *Bush Heritage* as a person who might be crazy enough to try and help out with managing Gambusia (they were all over the place) and trying to prevent Red-finned Blue-eye going kaput. I didn't immediately jump at it, because I thought it was a bit of a fool's errand given the remarkable survival skills of gambos, but I was scheduled to do one last big trip the following week – in the hotter-than-ever November of 2008 – so I pushed an imaginary pause button and said I'd call in to the property and have a look first.

What all the fuss is about: a male Red-finned Blue-eye from Edgbaston showing just how attractive and unusual the species really is. A.K.

Introduction

No matter what the season, Edgbaston is over-hot courtesy of the claypans that act like giant solar panels: they basically reflect the sun back up and seem to magnify it (if that's possible). My companion – a diminutive hippy called Jen Silcock who knows more about the botany of Australia's arid zone than just about anybody, directed me to a spring where Red-finned Blue-eye were known to occur, and then promptly disappeared crotch-deep into the sticky ooze of a spring vent a few metres away. It reminded me of dragging a stubborn sheep out of a race. With Jen plonked on the lunar-esque scalded claypan and covered in the smelly and black gunk that underlies Edgbaston I had a quick look at Pete's little fish. They were there alright – tiny little Blue-eyes, the males with bright red tails and fins, darting hither and thither in the 2cm deep and 40 degree-hot water. My initial apprehension lifted – just a little – when I realized just how tough and adapted they must have been to survive in such harsh conditions. Then it returned – with interest – when we stopped at another spring just down the track that was literally crawling with Gambusia. Surely it was only a matter of time – one big flood – until Edgbaston was gambo central and Red-finned Blue-eye went the way of the Tasmanian Tiger and countless other unfortunate Australian species. We jumped into the ute with a few thousand over-friendly flies and exited the property, coasting along the smooth blacksoil roads back to Longreach. We discussed the pros and cons of taking up the *Bush Heritage* offer, and I still couldn't quite bring myself to commit. It seemed like the weirdest job in the world – the chances of success entirely compromised by all those Gambusia breeding and feeding like there was no tomorrow. But sometime during the 14 hour drive in an old Hilux with no air-con all the way back to Brisbane I must have got hooked: the place was harsh and nasty and hot, but the springs were so unusual and interesting, and despite everything those mythical little fish were persisting: I really wanted to go back. And if I didn't go back, I'd feel pretty bad if, three or four years later, I heard that the weird little fish had disappeared off the face of the planet.

Within a month I'd signed a contract and was back chewing up kilometres on the Warrego Highway – I know it pretty well now courtesy of over 40 trips. On the first "real" one I surveyed the entire place – every spring we could find plus a few that had never been noticed – with a mate of mine from down south. It wasn't looking good: gambos infested 25 springs in massive numbers; we found Red-finned Blue-eye in only four (and one of them was tiny). That's when increasing the populations of Red-finned Blue-eye and establishing whether I could do anything about the gambos became my reason for getting up each day.

Methods, trials, results and stuff-ups

Red-finned Blue-eye are listed as an endangered species under both Queensland and national legislation, and as critically endangered by the IUCN – the international body with an interest in such things. To be honest, even without several million gambos invading their habitat they'd still qualify as endangered simply because their range is so limited. Although endangered listings have their advantages regarding protection, the mere fact that a species is listed doesn't necessarily mean that anything positive is being done to address their decline; in contrast, it actually makes doing things more difficult due to the amount of permission that is required. Complicating this situation further for Red-finned Blue-eye is the fact that all the other critters in the springs – the snails, plants, flatworms, ostracods and God-knows-what-else – are also endangered: they are all part of what is known as an "endangered ecological community". It was a pretty steep learning curve back in the beginning but I basically worked out really fast that working on Blue-eye was going to entail bootloads of paperwork alongside all the on-ground stuff.

Already mindful of the "endangered ecological community", I decided to try physically removing Gambusia from a spring or two in the first instance. We tried seine nets, traps, dip-netting for months, in the day, at night, several times a day – the amount of man-hours was fairly extreme. After 6 months, we actually managed to net gambos to depletion in a small spring (about 2m in diameter and up to 10cm deep) – but then we had a wet summer and guess what happened? I realized two things – first, that removing gambos from any of the bigger springs would be impossible using physical methods, and second, that preventing them re-colonising would have to be part of any long-term project. Nevertheless, the first problem was still the biggest – how to get rid of them.

I got hold of some Rotenone – a fish poison widely used in the US and elsewhere but not quite as commonly flung around in Australia. Then I got hold of some Gambusia from a Brisbane creek and worked out the best dosage rate and application method using a few aquariums: the stuff worked, and worked well, but obviously it was going to be a bit trickier out at Edgbaston. Along the way I submitted ethics applications to various departments and universities so that I could justify my experiments and tell people about them later. It wasn't all plain sailing, and there were plenty of arguments and a bit of wall-punching along the way. The longest permission process was with the feds – in the end I had to get a referral under the EPBC Act, and in the end it took the best part of two years – but after a lot of to-ing and fro-ing eventually I had permission to trial Rotenone in a couple of springs.

Most of the springs at Edgbaston are full of the various plants that love water that has come out of the Great Artesian Basin at 24 degrees for millennia as much as the fish do. It became fairly obvious fairly fast that applying Rotenone was only going to have a chance of success if we reduced the amount of plant material, so out came a big Stihl brushcutter and a few days of serious whipper-snipping. In the end, I applied Rotenone on two consecutive mornings on five separate occasions over six months to achieve the desired result (it's written up scientifically in Kerezsy and Fensham 2013 if anybody's interested). Although 90% of the gambos died during the first treatments, as everyone knows, getting rid of the last fish is the tricky bit. So it took a while, but at least it worked – I'd demonstrated that it was possible to remove Gambusia, a pest species, from a Great Artesian Basin spring, and – more importantly – that doing so didn't have an adverse effect on the rest of the endangered ecological community. This last bit was crucial – there's no point wiping out gambos if the process simultaneously wrecks the place.

Alongside the Gambusia work, the second main part of the project was to make sure that, if I could create suitable habitat, it was actually worth moving populations of Red-finned Blue-eye around. Back in the 1990s Steve Brooks, Rob Wager and a few others from the government had had a go at the same thing, but unfortunately none of those populations had survived by the time I started in 2009: they were either invaded by Gambusia or the springs had dried up. Nevertheless, there weren't too many other options, so I again filled out the paperwork and waited for the inevitable combination of yes/no/maybe/you must be dreaming responses from public servants across the country. As with the Rotenone, eventually I got a green light, but not before we'd done the genetics (to demonstrate we weren't likely to increase extinction risk) and demonstrated that the species really was up the creek without a paddle unless we did something.

Over the last six years I've generally moved groups of 20 individuals – I've always included a combination of males and females, as well as adults and juveniles, and I've always moved them to areas where I thought there was a better-than-even chance of survival. In two instances I was dead wrong – the springs just kept drying back, despite looking wonderful to begin with. In two more I honestly don't know what went wrong: everything looked good, the fish were

The escarpment at Edgbaston marks the eastern edge of the Mitchell Grass Downs and the western edge of the Great Dividing Range. A.K.

breeding, their numbers were definitely increasing, but then inexplicably they just crashed. However – and this is the good news – in four other instances the fish have relocated remarkably well. This means that now – 2014 – there are seven populations of Red-finned Blue-eye at Edgbaston, coincidentally the same number that were present back when Pete first had his Eureka moment back in 1990. Careful readers will be doing the maths about now and asking why seven and not eight – after-all, there were four back in 2009. The answer is directly related to the gambo problem/plague – although we have four new populations, in those six years one of the original four populations similarly succumbed to invasion by the live-bearers. They kicked on for a couple of years (the two species together), and I certainly rescued a few, but the moral of the story is pretty sobering: if Gambusia invade a spring where Red-finned Blue-eye are present the end result will be localized extinction of the native species. We're not –to this day – exactly sure how this happens. It's most likely something to do with the different life cycles – gambos give birth to live young, Blue-eye to helpless eggs. It could be more to do with competitive exclusion from the warm areas of the spring on a winter's night. It could be direct predation. But the more I think about it, it doesn't really matter exactly how they're doing it: as long as we know that the two fish species can't live together that's all we need to know. As managers it's our collective job now to make sure we keep at least those seven (and hopefully a few more) Red-finned Blue-eye populations free from Gambusia for as long as possible.

In the last two years I've started working on the other part of the problem – preventing gambos getting to the springs where Blue-eye are doing well. Like everything else, this is also a suck-it-and-see process. We carted an excavator and a truck out to Edgbaston and built a big earthen wall around the first population – it took about three days (and we only bogged the tipper once!). Then it rained like crazy and the water carved a drain at the downstream end, neatly circumventing all our effort. Since then, I've maintained this drain area using silt fence – a shadecloth-like material, dug in and suspended on posts. Seems to be working, but every time I visit I know there'll be a few hours of repairs and maintenance. The silt fence has since become my weapon of choice for gambo exclusion as it doesn't require heavy machinery grinding around the weird and occasionally soggy environment. The downside is that installing the stuff is all about hard labour. First I dig a 6 inch deep trench around the outside of the spring, then I bang in hardwood posts, then roll out the silt-fence – it takes forever. At first I

Silt fence installed around a spring containing a relocated population of Blue-eyes at Edgbaston. A.K.

used staples and cable ties to hold the fences up, but the wind cavorting across the claypans made short work of all the hardware. Now I use timber battens cut to size held on with tex screws; a bit more stuffing around on installation but a far better semi-long term solution. The occasional roo still hops the fences and clips them with tail or legs on the way over, but maintenance is straightforward – I always carry stakes, silt fence, screws, drills, hammer and batten material when I'm driving around, and most repairs are comparatively fast. At the moment there are silt fences around four Blue-eye populations, and – cross-fingers – no gambo incursions in two years. The next step is to install more fences around gambo springs, then Rotenone, then wait for a year or so, and – hopefully – relocate Blue-eye back to their former habitats. I imagine that back in the day – before gambos - the place was crawling with them.

The last piece of the puzzle is captive breeding, and this has also been a long and – at times – frustrating road. Back in the 1990's ANGFA members had a fair few populations between them – everywhere from Brisbane to Perth and Melbourne – with Adrian Tappin the recognized expert. But for a few reasons, by the time I landed at Edgbaston there were none in captivity. It all depends on who you talk to but like all fishy business there are a multitude of reasons that have been put forward regarding what went wrong. Some believe in the water quality theory (hardness), others in the territorial male theory. After six years of solid interaction with the species, and also Adrian's insights, I've naturally developed my own ideas regarding what might influence success in captivity.

Red-finned Blue-eye are tough as nails – they can withstand daily temperature variations of over 20 degrees, they can live in a sheet of 2cm deep water that can be 40 degrees in summer and 10 in winter, but they only live in Great Artesian Springs, and only at Edgbaston. The water out there comes out at a constant 24 degrees no matter what the season, so in winter I've seen them huddle around getting warm (presumably) and in summer I've seen them huddle around cooling off. Without access to that constant temperature water, maybe the wheels fall off? Without access to the wild variation, maybe their success is compromised? Incidentally,

when gambos invade a spring, they do exactly the same thing, possibly preventing the Blue-eye from using the spring vents for thermal control.

The second part of my (admittedly highly unscientific) theory relates to their recruitment. Like all Blue-eyes they dribble a few eggs each day rather than spawning huge numbers. This makes sense when you consider their size, but in red-fins it's extreme – they literally only drop one or two eggs a day. Adrian tells of getting up at five and searching the bottoms of his tanks to siphon eggs before going to work, but he certainly never got hundreds. I've given this plenty of thought on the long drives, and like everything else, it makes perfect sense. The springs where the Blue-eye live are the most variable freshwater habitats you could imagine. At night, they expand in area (because the flow is constant), but then in the day they contract due to evaporation. They also come and go through time, so it's actually natural for local populations to go extinct, and for "new" springs to remain fish-free prior to colonisation opportunities. A small spring with a surface area of less than 3m squared simply can't support a really big population of fish, so there's no biological point in the species dropping hundreds of eggs – far better to keep the population ticking over constantly. Also, a drop of rain or an overland flow means an increase in spring area – it could be for a few weeks or maybe only a few days – but if there are multiple-age juveniles around they can capitalize, and if the spring joins up with a creek line or a neighbouring spring they could migrate. But again, there's no point spawning once or a few times a year if this is the case – far better to have a constant flow of eggs, larvae and juveniles so that the populations can react in whatever way is most appropriate to their unpredictable surroundings. What it all means for captive populations should be obvious – they're tricky; no mass spawnings, no big cohorts, plenty of fiddly work, potential small number of healthy offspring. Adrian kept them for five or six generations – next time around we need to at least equal and hopefully better that in order to demonstrate the legitimacy of the exercise.

Whether we're all right or wrong, or half-right, or close to the mark, is academic at this point, because by the time all the captive populations went kaput the little creature was listed under every bit of legislation going as either endangered or critically endangered, which means that nobody can keep them in captivity without a collection of permits as long as your arm. I've been working on it for two years, and I'm finally at the point where we can begin the process of trying to keep a captive population. Unfortunately though – and unlike before – it'll have to be fairly well documented and it'll be a while before they become available to hobbyists (if ever).

The enemy: Gambusia inhabit more than 25 springs at Edgbaston, and displace red-finned Blue-eye once they colonise. A.K.

But at least it's starting. I'll definitely sleep better at night if I know there are some red-fins that aren't on the Edgbaston floodplain, especially when I hear there's been a downpour of five or six inches.

The future

As stated above, we've come a long way in the last five or six years, and *Bush Heritage Australia* deserve credit for buying Edgbaston and making a commitment to conserving Australia's most ecologically-diverse Great Artesian Spring complex and saving our most endangered freshwater fish. The company has also done a fantastic job of raising the profile of the species at local, regional, national and even international level: in late 2012 it was named as one of the world's 100 most at-risk species by the IUCN and a profile was included in the book and associated publicity activities. But it may be salient to remember that the company is a private not-for-profit. It relies entirely on donations to continue this work. If Edgbaston had been purchased by a government entity I wonder whether the recovery program would have been as thorough, and I wonder whether the number of red-fin populations would now be back to the same number as when the species was first discovered?

To be frank, I suspect not. The reason the project has been successful to date has been due to diligence and persistence rather than any happy accidents. Managing Edgbaston and the fish into the future will require the same amount of effort, dedication and persistence. There are – unfortunately – no magic bullets and no short-cuts when it comes to imperiled species. It's just three steps forward, two back, lateral thinking, adaptation. Just like the little fish themselves really – who knows what the next season will bring?

Moa Island Fish Survey

by Glynn Aland

In March 2008 I had the opportunity to visit Moa Island with my siblings Dione and Kieran Aland. This was after spending time with our younger brother at Mabuiag Island. We had arranged for transport by dingy with Uncle Moses and Aunty Margaret and cousin Tai who were due to return to Badu Island nearby, with crayfish tails and their luggage. We had perfect weather and the boat ride South gave us a better appreciation of the terrain of Moa Island.

Moa Island is the second largest island in the Torres Straits, and is sited mid-way between Cape York and Papua New Guinea. I had hoped that with a close proximity to Papua New Guinea and that it was in the middle of what was a landbridge to Papua New Guinea, that there may have been range extensions of the freshwater fish fauna. At the time of the survey the freshwater fishes found on the Island appeared to have been poorly studied. Moa Island is dominated by eucalyptus woodland, however other vegetation types including paperbark swamps, rainforest and tidal mangrove fringing communities do occur. From the air sand dunes were also visible to the central west of the island, which are often accompanied by tannic swamps and swale perched lakes, unfortunately the access to this area was not achievable for this first visit.

On arrival at Moa Island, Kieran had arranged for a meeting with elders and land owners at Kubin village via the Island Council, where we sought permission to camp at the headwaters of Kai Creek. We aimed to survey fishes, insects and reptiles (DNA samples), with specimens to be lodged at the Queensland Museum, with our long suffering sister keen to spend time with the boys. After meeting with a number of elders, who were aware of our family's involvement in the Torres Straits in the 1960s and 1970s and establishing our connection to the present landowners by family ties, we were granted permission and were given a lift to an overgrown four wheel drive track to the north of the Island.

Checkered Rainbowfish, *Melanotaenia splendida inornata,* from Kai Creek. G.A.

Kai Creek habitat shot. G.A.

Adult *Melanotaenia maccullochi* from Kai Creek. G.A.

Adult *Pseudomugil gertrudae,* Spotted Blue-eye (male) from Kai Creek. G.A.

Left: Epiphytes and Red Shampoo Ginger (right) both at Kai Creek. G.A.

Tutalai Creek Crayfish, *Cherax rhynchotus*. G.S.

After hiking in to our campsite through spear grass, we came to the upper reaches of Kai Creek (translated this is Dinner Creek) and both names appear on topographic maps dependant on the year of printing, this is part of the largest catchment on the island and drains to the west. We set up our tents on the border of rainforest and eucalypt woodland and started to explore.

The first fish I saw were checkered rainbowfish up to 8cm long in the crystal clear creek, but before looking at the fish I saw obvious signs of saltwater crocodiles with belly scrapes and foot-prints clearly obvious on the sandy bottom, I estimated that one croc was in residence, probably a juvenile less than 1.2 metres long, this raised concerns that there may be larger reptiles in the area. After collecting firewood and pitching tents before darkness, we shared a quick meal before exploring. Over the next few days and nights we surveyed the upper Kai Creek area both during the day and at night with a head torch. Dione looked after the camp and Kieran hiked up stream and set his pit fall traps for insects and explored up to the summit of the largest hill on the island and generally explored the rainforest. Kieran later assisted with dip netting and we found (listed in terms of abundance):

Spotted Blue-eye *Pseudomugil gertrudae*
Checkered Rainbowfish *Melanotaenia splendida inornata*
Poreless Gudgeon *Oxyleotris nullipora*
Freshwater Crab *Austrothelphusa* sp.
McCulloch's Rainbowfish *Melanotaenia mccullochi*
Purple Spotted Gudgeon *Mogurnda c.f. mogurnda*

The fishes, including the Spotted Blue-eyes, Checkered Rainbowfish and the McCulloch's Rainbowfish were as attractive if not more pleasing than what occurs on Cape York, and the Freshwater Crabs ranged from a grayish-cream colour on females to bright orange on larger males and the range of colour appeared to exist in the same species!

Day 2. We woke to the sounds of birdlife, many of which I couldn't identify, there was even the occasional Ulysses butterfly flitting past. After a morning dip net in Kai Creek, Dione and I hiked to the North to look at another small catchment based around Tutalai Creek, a very small stream which flowed to the North of the Island. The hike followed a four wheel drive track made during the second world war and the days of mining wolfram. We continued for approx-imately 4 kms until we came across a sedge swamp, by this time we were both footsore, with constant monsoonal showers, waterlogged feet and sandy grit working into our reef sandals. I dip netted puddles and the head waters of Tutalai Creek, then walked back to the headwaters late that night and found :

Spotted Blue-eye *Pseudomugil gertrudae*
Checkered Rainbowfish *Melanotaenia splendida inornata*
Crayfish *Cherax rynchotus*
Freshwater Crab *Austrothelphusa* sp.

The evening lone survey was harrowing, with a very small area of illumination, unknown threat of crocodiles, intermittent rain, sounds of wild boars crashing through the vegetation and the threat of a possible hermit in the area who was rumored to be living nearby as an illegal immi-grant from Papua New Guinea and periods negotiating a faint four wheel drive track in total dark while conserving torch batteries. Back at camp Dione was very happy to have the boys back, Kieran from the reptile and insect surveys and myself from the fish survey, as she had been holding down the camp for hours with similar spooky surrounds, and a camp fire that had extinguished due to the rain. The campsite was approximately 7 kilometres from the northern Moa Island settlement of St Pauls Community. A very long walk in the dark, and a remote location if things went pear shaped! The afternoon walk and the evening survey was successful

Kai Creek Freshwater Crab (*Austrothelphusa* sp.) female (above) and male (below) G.A.

with similar colouration to the Kai Creek fish and the bonus of finding that a freshwater crayfish species exists on the Island.

Day 3 saw Kieran and I finish surveying Kai Creek upstream of the campsite. We didn't increase the species count but used the survey to collect some live fishes to bring back to distribute to a number of ANGFA members. This was also a very good opportunity to look at the rainforest vegetation closely, and it was amazing to observe up to 4 species of epiphytic wax plants *Hoya* spp growing on the same host tree, there were occasional patches of ground orchids, and a profusion of epiphytic orchids on host trees, both within the eucalyptus woodland and the rainforest.

Day 4 saw us hike out carrying camping equipment, pickled specimens and live fish (carried out in a styrofoam esky carried in chaff bag) to the main road linking Kubin Village and St Pauls Community, where we arranged to have the island taxi pick us up. Nearby we found a small dam with the overflow running north east towards Saint Paul Community. After a quick dip net and look under rocks at the wall diversion we found crayfish *(Cherax rynchotus?)* and a very nice form of Pacific Blue-eye *Pseudomugil signifer*, similar to the nearby Mabuiag Island form. After pickling a few Blue-eyes and crays and bagging some live fish we were picked up by the Island's one taxi and travelled back to Kuban Village, where we were staying at the Council Guest House and meeting for Kai-Kai (evening meal) with the Nawai family, this was also to be attended by the Savage and Manus families all of whom had given permissions for our adventure. The evening meal was a great experience and was a chance to make firm friendships with the families, all related via our younger adopted sibling and also related to close teenage friends from back in Cairns. After Kai-Kai we surveyed a swampy area adjacent to a water holding dam near the Moa Island Airport, where we found large numbers of Spotted Blue eyes in the shallow water which had once been the market gardens for the community, in addition oxe-eye herring could be seen patrolling the deeper water of the dam, which wasn't sampled due to the abundance of crocodiles in the area. We also saw what appeared to be a gudgeon shaped fish approximately 10 centimetres long under a box section culvert nearby, this fish proved difficult to catch. Once it was dip-netted we found that it was a sunset goby *Bostrichthys zonatus*, which was a relief as there is a very real threat that the noxious climbing perch *Anabas testudineus*, which had been found on Saibai Island to the north may have invaded as far south as Moa Island, and could be spreading even further south to the Australian mainland.

Day 5 was our departure day, and started with a revisit to the area which was surveyed the previous night, near the airport. Here the live fish were given a water change and a profusion of a lilac flowered fringe lily could be seen, which do not appear to exist anywhere else. This plant should have potential in cultivation and would warrant further study. After packing up, it was time to fly out.

The trip to Moa Island was a wonderful experience. The specimens we caught and lodged at the Queensland Museum from the trip have already been utilized to write a scientific paper of the freshwater fish from the Torres Straits, the fish have been DNA sequenced and are contributing to our knowledge, and the McCulloch's rainbowfish are being enjoyed by many ANGFA members. I firmly suspect that there may be more freshwater fish species to explore on the Island, and hopefully the next trip will extend the known number of freshwater species for the island.

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Koonunga cursor (male). T.R.

Notes on an ancient and tiny Crustacean, The Syncarid: *Koonunga cursor*

Phil Littlejohn

Introduction:
The Syncarids of Australia are a mostly little known group of small crustaceans, consisting of over thirty species, with the majority found in south eastern Australia. They predominately live in the cooler waters of aquifers, caves, hyporheic areas of rivers, and in headwater reaches of creeks. Importantly they must have access to permanent waters as they are unable to resist desiccation. The adult size can range from 0.5mm to about 50mm in length depending on the species. For many years I have travelled the countryside searching in vain for any of the numerous Victorian species until someone I had been corresponding with earlier this year, gave me a confirmed location. It turned out that one species of Syncarid, *Koonunga cursor*, was literally living on my doorstep – the location was only 20 minutes from my home!

Description:
Koonunga cursor is a member of the family Koonungidae and grows to approximately 10mm in length. They are dorsoventrally flattened (from top and underside) and characterised by having large leg like appendages (Pleopods) on each abdominal (body) segment, giving them an appearance of a cross between a shrimp and a millipede/centipede (details best seen under magnification). Another characteristic is the triangular telson (middle flap of the tail) which has an array of spines along the margin. *Koonunga cursor* can be light to dark brown or black in colour with some having a pale patch mid-underbelly (possibly egg laden?). The eyes are present and sessile (not stalked) and as the animals are nocturnal, they avoid light. Another species from South Australia, *Koonunga crenarum*, looks very similar but is blind. There are reports that *Koonunga cursor* also occurs in Tasmania.

Curly Sedge Creek, Wollert – a typical habitat. P.L.

Receding water, Epping, which *K. cursor* shared with *Engaeus* species. P.L.

Amphipods are commonly caught with *Koonunga cursor*. P.L.

Clasping mid body – possible mating ritual? P.L.

Habitat:

The genus Koonunga was erected by Sayce in 1907, with the name referring to the aboriginal name of a creek near where specimens were collected (Koonung Creek). The type locality (from which the species was described) was recorded as "small freshwater reedy pools beside a tiny little runnel which joins the Mullum Mullum Creek, Ringwood, near Melbourne, Victoria". The Mullum Mullum Creek is a tributary of the Yarra River, and is the next southern tributary upstream from Koonung Creek. Unfortunately the catchment of Mullum Mullum Creek has been highly modified, its reedy pools infested with the exotic fish species *Gambusia holbrooki* and most runnels or tributaries are now storm water drains, so it is doubtful koonungids still exists in the Ringwood area.

Distribution:

Since its description, there have been few collection records, those few I could find referred to sites scattered west of Melbourne. I believe the scarcity of recordings is due to lack of specific sampling, probably because the species is so small. From my own observations, the habitat they are most likely to be found in are areas of cool water, in quiet areas in flowing systems and in areas with access to ground water if waters dry up.

I have found they are sometimes common in the most unlikely places where one usually wouldn't think to sample, such as in roadside drains, or in the very absolute upper headwater reaches of creeks where there are no fish. I do forgive myself for taking so long in finding a Syncarid. If you are not specifically looking for them, they can be very easily overlooked. *Koonunga cursor* can superficially resemble mosquito or chironomid larvae (which they often co-exist with), you have to know what you are looking for to find them. Plus I also realised that the 3mm mesh I was using on my collecting net was simply too large. Since replacing my net with an ordinary 20cm x 15cm aquarium dip net with 1mm mesh and getting my eye in, *Koonunga cursor* have really begun to stand out. When caught they have a characteristic movement within the net, somewhat like an (elongated) amphipod "flicking their tail" as they try to escape. No need for buckets and the like, an aquarium dip net and a small plastic bag is all the collecting equipment needed. I've been on a roll since first finding them, and to date I have recorded them from over twenty locations, all south of the Great Dividing Range and all from the Yarra River catchment, with several sites even found on the way home from work! I have a particular interest in documenting the extent of their current range, and am sending my findings to Tarmo Raadik at the Arthur Rylah Institute for Environmental Research (DEPI), for inclusion on the Victorian Biodiversity Atlas database. It will be interesting to see if *K. cursor* exists north of the Great Dividing Range, and if it is still present in the now degraded Mullum Mullum catchment.

My sampling strategy was to open my street directory to the area of my first location and then head for the headwaters of any tributary in that area. I then just kept branching further out to other nearby creeks. When driving I check the natural drainage pattern in the catchment, searching for swamps or floodplains with easy access adjacent to the road. If there is a pool of water, whether clear or muddy, there is a chance of success as I have found that any body of water is potential *K. cursor* habitat.

I've now collected koonungids in bodies of water no deeper than 10mm and in muddy pools no larger than 200 litres in drying creek beds. I've also netted the species in the shallows of deep pools amongst flooded grasses along the pool's edge, but I believe this type of habitat is an exception. I get some interesting looks from passer-bys, even more so when trying to explain what I am doing in a roadside puddle! Almost every time I have found *K. cursor* I have also found burrowing crayfish (genus *Engaeus*) or at least evidence of their burrows.

Nodules on antennae of male. P.L.

Burrowing crayfish (*Engaeus* spp) share same habitat. P.L.

Sometimes Common yabbies *(Cherax destructor)* are also collected, though usually at sites with more permanent waters. Amphipods are also usually present. It will be interesting to identify the species of *Engaeus* found with *K. cursor*; there may be a relationship in their respective distributions. Some of the locations do not have surface water year-round and perhaps *K. cursor* take refuge in the crayfish burrows and chambers that hold water during these times, or else in the substrate or water table. I have never caught koonungids and fish together, although Southern Pygmy Perch *(Nannoperca australis)* have been recorded in the close vicinity of at least one location. Finding *Gambusia* in areas of potential *K. cursor* habitat is worrying. No doubt *K.cursor* would be food for hungry *Gambusia*. Perhaps koonungids (Syncarids) had a bigger historic geographic range, including more permanent waters, before the introduction of feral *Gambusia*, knowing the capabilities of the species reaching even the most upper regions of creeks and swamps.

Behaviour:
Although they can swim very well, *K. cursor* are benthic animals with the usual mode of movement being quick bursts along the substrate using their extended Pleopods as "additional legs". The species name *cursor* refers to this distinctive mode of locomotion ("runner" or "running messenger"). They can quickly escape potential danger in the water by a "mosquito like" flick of the body to change direction. They seem to fill a niche in occupying ephemeral aquatic habitat where the periodic drying up of surface waters eliminates a percentage of potential predators (such as fishes). My guess would be that koonungids are preyed upon by damsel fly and dytiscid beetle larvae which are often also present.

Sexing:
Little is known of the life cycle. Female Syncarids do not hold eggs in a marsupium brood pouch such as the amphipods, and are said to shed eggs into the water which then develop directly without free larvae stages. Sometimes when newly caught, smaller *K. cursor*, which I assume are males will grasp a larger one (females?) on top of the mid body for reasons I don't know, perhaps as the first stage of mating? Larger males can be distinguished by round nodules at the base of the forked upper antennae, and females have a receptacle or small pouch (Spermatheca) for spermatophore uptake in the middle of the sternum just forward of the last set of legs. I have collected small specimens only 2mm in length early in the month of September.

Diet:
Koonunga cursor are detritivores and possibly eat algae/diatoms. What they feed on while underground during prolonged dry spells remains a mystery.

Conclusion:
The rapid expansion of urbanisation in Melbourne's north is encroaching over the habitat of *Koonunga cursor*, which I find concerning. My personal observations over many years show that natural drainages and water courses in areas becoming urbanised are converted to drains to fill "water features" in new estates, ultimately ending up infested with *Gambusia*, and the odd shopping trolley. Being hardy creatures, koonungids are an interesting subject for a non-fish Nano tank, perhaps with Janirid isopods, *Amarinus* crabs, freshwater limpets and Sphaerium "mussels" added for additional interest. My own experiences have shown me that koonungids make ideal subjects for study. Hopefully in the near future we can learn more about the behaviour and life cycle of these cryptic crustaceans.

Credits/Acknowledgements/References

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The headwater of Mullum Mullum Creek – now a stormwater drain. P.L.

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