# GRDC PODCAST TRANSCRIPT

**Nail the Snails**

[00:00:05] **Intro** This is a GRDC podcast.

[00:00:12] **Camilla Plunkett** The infestation of snails in Australian grain crops is no slow moving business. From seedling attack to contaminated grain, snails are creating significant harvest losses and additional costs to growers. Hello, I'm Camilla Plunkett. A $4.6 million research project, led by the University of Adelaide and SARDI, the South Australian Research Development Institute, will develop new tools and management techniques to combat several mollusc species. This GRDC investment will be a four year collaboration across Australia with the University of South Australia, CSIRO and the NSW Department of Primary Industries and Regional Development. I spoke with senior research scientist and project leader, Dr Kym Perry to find out more about pest snails and what is being done to effectively control them. Thanks for joining us today, Kym. Can you tell us what type of snails we're dealing with on this national level and how did they end up in our crops?

[00:01:23] **Dr Kym Perry - SARDI** There are four main species. All of them are introduced from the Mediterranean region in Europe sometime in the early 1900's. There are two round shape snails. One's the Vineyard snail, Cernuella Vigata. The other is the Italian snail, Theba Pisana and two conical shaped species, one's the Conical snail, Cochlicella Acuta and the Small pointed snail, Cochlicella Barbara. These snails have been in the country around 100 years. They've managed to spread themselves throughout cropping areas in all the southern mainland states of Australia. And it depends where you are as to which of these snails you might be dealing with. In South Australia, growers are dealing with all four species in some areas. In Western Australia the main pest snail would be the small pointed snail and in Victoria and New South Wales, it's largely the vineyard snail causing issues over there. In terms of why they've ended up in crops, well, these organisms have somehow got themselves into the country. They're obviously not very mobile themselves, but they are extremely good hitchhikers and they're very good at climbing onto vehicles and being driven around the country. You'll often find them along roadsides and at vehicle stops and places where there's a lot of traffic. Fodder is another way of snails spreading, they get themselves into animal feed, and if that feed is moved into clean areas, then all of a sudden you've got a local snail population and also contractors moving between properties can inadvertently move snails. And the challenge is that this slow spread of snails is often unnoticed. It's very quiet. No one's blowing trumpets. These things just quietly go about their business of spreading themselves around. All of these snails are highly invasive species. Every new infestation always starts very small with just one snail or a few snails, and then over time, it just builds up, until eventually you'll end up with thousands or even millions of snails in a new area.

[00:03:15] **Camilla Plunkett** For such a slow moving creature, they certainly are invasive. Can you elaborate on their breeding cycles and how they've become so prevalent across Australia?

[00:03:26] **Dr Kym Perry - SARDI** These snails are, as I said, very invasive. They are what's called hermaphrodites, which means that both male and female sex organs exist in every snail. Every snail can lay eggs, so they do need to mate, but every individual snail can lay eggs. A pair of snails can lay up to 3000 eggs in their lifetime for the round snails and for conical snails, it's about 400 eggs in their lifetime, so they're capable of building up populations quite quickly. They're also very well adapted to survive in the Australian climate. Their hard shells enable them to survive heat and water loss in summer, and there are not many natural enemies of these things in Australia, as is often the case with invasive species, they move to a new area and they don't bring their natural enemies along with them. So there's not a lot of natural bio control going on. And finally the snails are still spreading. They seem to be getting themselves into new areas and we know from modelling work that the potentially suitable areas in Australia are still not completely colonised by the snails. There's still some new areas they haven't got themselves to yet. So yeah, they're very good hitchhikers.

[00:04:33] **Camilla Plunkett** Can you tell us about the issues affecting the grower as a result of these out of control snail populations and what direct impact are they having on crops?

[00:04:43] **Dr Kym Perry - SARDI** These snails feed on both dead and living plant matter. During crop establishment, they can certainly cause quite a lot of damage to young crops and sometimes those crops need to be re sown. The major issue though is that in spring and summer when the weather warms up, these snails climb up onto objects off the ground to escape the heat and they can end up in the header. Snails are very difficult to manage as well, they're similar to weeds. It's not really been possible to eradicate them, and so growers are having lots of difficulties trying to manage them. At harvest, contamination of snails can result in value downgrades of the grain delivery or even rejection of entire loads, and that causes a lot of issues with bottlenecks at harvest, a lot of delays and frustration. Every time a grain truck is returned back to the farm to clean, the harvest operation sometimes has to stop and the grower then has to double handle the grain, to try and clean all the snails out of it before sending that load off again and that delays the harvest. Snails can also create a real mess in the machinery, causing clogging and damage. The costs of managing snails are extremely high. So, many growers are spending lots of money on bait every year, they will often bite several times. In summer, there's a lot of controls that need to happen and these can be very costly and labour intensive. At harvest, grain cleaning and double handling is very costly and labour intensive. And finally, what's not often considered is the opportunity costs that snails cause. Some growers are not even growing certain crops because of snail issues. Sometimes things like peas and canola can be difficult to get snails out of. So there are a lot of costs involved in total for snails, and there are not many natural enemies of the snails. So basically, they can spread largely unabated in many cases and we know that they're still spreading through human movement.

[00:06:31] **Camilla Plunkett** Are there any management techniques or tools growers can use at this stage to manage snail infestation?

[00:06:38] **Dr Kym Perry - SARDI** Snails is one system where we do have a truly integrated management approach. It really starts straight after harvest. The idea is first to try and kill as many snails as possible over the summer, so that we don't have as many for the following cropping season. In the summer, controls include things like cabling or chaining, where you drag along long cable between two vehicles and try to knock the snails onto the soil to kill them when the weather is hot. Rolling is very common as well, so trying to crush snails and remove the stubble refuges for mixed farming operations, grazing can be used to trample and dislodge some snails. And in the older times burning was very common as well, burning of stubbles, but the problem is with burning, if you do it in coastal areas, then soil erosion becomes a real issue and of course, burning's not great for subsequent crop production, so burning is less common nowadays. In the autumn the idea is to stop them breeding by putting out snail bait before they lay their eggs. And the timing of this is very important. We know that snails move a lot more than we previously thought, and so growers really need to be on the lookout for snails starting to move around and feed, right near the end of summer because what they do is come out of dormancy, they feed, they mature their reproductive organs in preparation for breeding, and then they'll mate and they'll lay eggs in the soil and they breed basically between autumn and spring, but they do most of their breeding in the early part of autumn and early winter. So if you can kill as many of those adult snails before they breed, it will definitely reduce the population of juvenile snails before spring and the final step is harvest. So even with great management, there will be lots of snails left over at harvest that growers need to deal with so that the idea there is to try and minimise the intake of snails into the harvester with things like early harvesting and then anything that does get into the header will need to be cleaned out of grain afterwards. So it really is a year round approach for snails. The problem is that even when that's done really well, it's not working well enough for many growers and in particular a lot of those management strategies are more effective against the round snails than the conical snails. Now, the conical snails emerged as really the most difficult of the snails to manage, they're also very difficult to get out of grain at harvest.

[00:09:02] **Camilla Plunkett** While crop damage, harvest delays and grain value downgrades are certainly affecting growers across the nation, the GRDC's new investment: More effective control of pest snails in Australian grain crops, has a multifaceted plan to tackle the problem head on. Kym, we know these snails are so destructive Australia wide, however, there is hope and it's quite exciting and varied in approach. Can you tell us about the trials and the different ways you're going to combat snails in the affected grain crops?

[00:09:35] **Dr Kym Perry - SARDI** Thus far there's been no silver bullet control technique that's worked well enough alone for snails so, it's certain that an integrated approach is still going to be the way to go heading into the future. And that's the approach we're taking with this project. We're trying to make improvements across a number of areas and hope that something works well enough to make a breakthrough for farmers. So the three main areas that we're tackling are monitoring techniques, developing some new controls and also generating some biological information, which will help us design some better targeted strategies. So just going through those one by one, monitoring is obviously crucial for effective management, but it's very difficult to do, particularly across large areas. So what we're trying to do is develop some technology for automatic monitoring, so that growers can better target the timing and the placement of snail controls. The first one of these is counting snails in paddocks, using AI vision based technology, and the idea here is that if we can find a way, we'll develop a way of generating spatial maps of snail densities in paddocks, then, we'll know where the problem areas are and where management can be targeted. So that works being done with the University of Adelaide and the Australian Institute of Machine Learning. The second thing we're doing there is developing automatic sentinel stations for tracking snail movement in the late summer and autumn. And the idea there is that we'll use cameras to collect footage of snails. We'll have field deployable units with both cameras and environmental sensors in the landscape. The footage will then be sent to the cloud and the images will be analysed using AI algorithms which are currently being developed by the Australian Institute of Machine Learning. And then these units would send growers an alert of snail movement and when baiting should occur. So, I think these are fairly exciting developments. The second main area is developing a couple of new controls for snails, so one of these is getting rid of snails in summer using a new technique. So currently one of the best techniques for killing snails in summer is cabling. The problem is you need hot soil for cabling and in some of the coastal areas there just aren't many hot days each year, which limits opportunities, and on the hot days everyone wants to be at the beach, not turning across a paddock. Rolling also works okay, but it's a bit slow. So we're working with the University of South Australia to try and develop a new rapid distraction technique that kills snails quickly without needing hot soil. The second avenue we're looking at is a new way of separating snails from grain, so as I mentioned earlier, conical snails that are the same size and shape as grains are very hard to get out, using screening and other standard techniques. So we're working with University of South Australia looking at electrostatic separation as a new technique. So trials are currently being done in the laboratory, using a range of snails and grains, and if this works, it could really make a difference for growers at harvest. Another area we're looking at is bio control. So in South Australia we have a parasitoid fly which was brought in from France in the early 2000's and it attacks conical snails. What we're planning to do is release this fly in Western Australia for the first time to target the small, pointed snail over there. So fire control, once established, it's basically free pest control for farmers, which doesn't require any effort or any chemicals or anything. It will basically self-sustained and it won't kill every snail, certainly, that's not how biocontrol works, but it will be part of the toolbox to help suppress snail populations. And the final area, as I mentioned, is biological information. All of good management for snails and other pests really relies on knowing your enemy and knowing what are the vulnerable stages in the pest life cycle to target. So there are some key knowledge gaps we still have around snails. One of them is around distribution, where are the snails? How many are hiding in the soil as opposed to those on the surface? Most of our existing controls for snails are targeting snails on the soil surface, but we really don't have a good appreciation of how many snails are actually up at the time that we're doing these controls, versus snails that are hiding in refuges. We know that many snails, possibly well over half of the population, is hidden in refuges at any given time, so we'll be looking into that. Another area is density. You know, sometimes you see odd things where a large population of snails for some reason doesn't give birth to very many offspring, whereas only a few snails can produce heaps of offspring. This is a thing we call density dependence. It basically means that snails may be able to bounce back from low populations if control's not good enough. And so we've currently got some experiments running to try and understand this and also help us to predict the amount of control that we need to give us cost effective suppression of populations when we're doing things like baiting. Another area of work is crop rotations. We know that snails can build up numbers in some crop rotations more so than in others. Canola seems to be a classic for conical snails. So together with CSIRO, we're looking at how snails use these crops as food and how it affects their population growth. And hopefully this can help inform what's likely to happen when we grow certain crops or even help us inform what rotations we can use where snail risk is high. Another area is attractants, so if we can identify compounds that we can use to attract snails, we may be able to design things like barriers and traps to trap them and kill them. So we know of a few attractants that have been discovered overseas and we're planning to test those on our species to see how attractive they are and if there are opportunities to develop some new control methods.

[00:15:26] **Camilla Plunkett** So monitoring techniques, developing new controls and generating biological information. It certainly is a multifaceted approach to managing this problem. Kym, the trial runs until 2026, what can we look out for in the years ahead?

[00:15:43] **Dr Kym Perry - SARDI** Yeah, it's exciting to have a project of four years and it's allowing us to test a whole range of new ideas with snails. We're hoping that, a few of these ideas might work well enough and then be able to be developed into tools for growers. Growers will also know about the new updated snail manual that's recently been released. This is an update of the Bash'Em, Burn'Em, Bait'Em, manual that was first published 20 years ago. The new manual incorporates a lot of recent research information, things we've learned around snails that we didn't know previously, particularly around movement and timing of baiting. The manual also focuses more on the key recommended actions and things to think about throughout the year as guidelines to help get the timing of these things right.

[00:16:23] **Camilla Plunkett** Yes, it's just been updated and the updated version is called ‘Nail the Snails’ and it's on the GRDC website. For growers out there who are listening today and thinking, oh, I've been monitoring my crop and I've seen these snails or I've seen different snails to what I normally see, or I really want to be part of this new research and development. How can they get involved?

[00:16:47] **Dr Kym Perry - SARDI** Oh we always love growers getting in touch with us with their observations and ideas around snails. A lot of the most effective controls have actually been designed by growers. Growers just have such a wealth of experience, so much cleverer engineers than I am. So yes, still free to get in touch. Our project has an advisory group which includes key growers from various regions as well as funders and stakeholders and our project team, so we are regularly interacting with farmers and always keen to engage and any ideas are always welcome, so please do get in touch.

[00:17:25] **Camilla Plunkett** You've been listening to Dr Kym Perry from SARDI, giving us an insight into the research of the GRDC investment - most effective control of pest snails in Australian grain crops. If you'd like more information, head to the GRDC website and click on the Slugs and Snails button on the home page, where you can find additional resources and the newly updated manual, Nail the Snails. I'm Camilla Plunkett. Thanks for listening.