Presenter: Associate Professor Bob Wong - *2018*

Title: Sex in a changing world. (13:35)

Time	*Dialogue*
00:13	Thanks-you. My name Bob Wong. I'm an Associate Professor based in the school of Biological Sciences at Monash University and today I'm going to be talking about the challenges some wildlife face when it comes to sex in an increasingly human dominated world. So I'm a Behavioural Ecologist which means I'm interested in understanding animal behaviour from an ecological and an evolutionary perspective. For most of my career I've been focusing in on the reproductive antics of fish.
00:40	I've been really fortunate in the course of my career to have travelled to some really amazing places around the world from the crater lakes of Nicaragua to the desert springs of central Australia which is the home to this particular critter, the Australian desert goby. But during the course of my career as I was travelling to these amazing locations it became increasingly apparent that human induced environmental change was having a huge impact on the natural world and I was increasingly being greeted by scenes such as this.
01:06	So what we have here is one of my field sites, Ockenden Springs in Central Australia (SA) which is home to the Australian desert Goby. And you can see that human activity has left its mark. In particular livestock grazing in this case. The cattle have trampled the margins of the spring and they are also contributing nutrients and other pollutants directly into the water.
01:29	And you can probably see that there is a cow that has probably managed to get itself stuck in the spring itself and it has died and is in the process of decomposing and all the decomposition is going straight into the water itself. So scenes like this made me increasingly interested in trying to understand how human induced environmental change might affect reproduction and what the ecological and evolutionary consequences of that might be.
01:54	Now several hundred kilometres west of Ockenden Springs lies the coastal town of Dongarra in Western Australia. Several decades earlier, long before I started my academic career a couple of scientists were walking in the bush just out of town and they came across this rather intriguing sight. Now what was actually happening here was the male beetles were being drawn to the brown shiny surfaces of the empty stubbies, which actually bear a striking resemblance to the brown shiny surfaces of the forewings of the females.
02:27	But with one noticeable difference. Beer bottles are much larger than real females so these beer bottles were acting as a sexy super normal stimulus that was actually attracting all of these male beetles. So apart from losing out on real reproductive success the scientists also noted that there was another cost. The male beetles were being attacked by ferocious meat ants.
02:51	So initially when you look at a scene like this you might think it is kind of funny. Beetles on the bottle, but it does underscore a really important possibility that is our activities can potentially impact reproduction in wildlife. Now most of you will be familiar with the concept of natural selection which Charles Darwin came up with to explain the evolution of traits, including the evolution of behaviours that are driven by the struggle to survive. A good example would be a prey species that have evolved traits which help them to survive against predators.

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03:22	But of course Darwin recognised that merely surviving wasn't enough. Animals also have to reproduce and he came up with the concept of sexual selection to explain the evolution of traits and behaviours that are driven not by the struggle to survive but by the struggle to reproduce. And today we know that sexual selection is a powerfully evolutionary force responsible for much of the weird and wonderful life that we see on this planet.
03:47	Sexual selection for example is responsible for the evolution of weapons such as the antlers we see in these stags which males use to fight one another for access to breeding females. Sexual selection is also responsible for the bright colouration and gaudy plumage and ostentatious courtship displays of birds of paradise which males use to attract females for mating.
04:10	Now scientist know that sexually selected traits are generally very costly for animals to produce and they are context dependant. So using the peacock as an example; we all know that male peacocks are brightly coloured and they have this elaborate train of long tail feathers which they display to females during courtship. But of course bearing such an expensive elaborate trait can be energetically costly and it can also increase the vulnerability of males to would be predators like tigers.
04:40	So the idea here is that only the highest quality males; the highest quality suiters should be able to bare the high cost of producing and maintaining these showy sexy traits. But of course showing off requires a context and an important question to ask is "What happens when that context changes? What happens when the environment changes and how does that impact reproductive behaviours and sexual selection?"
05:05	As I've mentioned humans have bought about unprecedented changes to environments worldwide so researchers such as myself are increasingly becoming interested to understand how these changes might impact animal behaviour and in particular reproductive behaviours. Now one potential impact of human activity especially in aquatic habitats is eutrophication.
05:29	So eutrophication occurs when there is an input in nutrients from human activities, for example agriculture and as result of this increase in nutrients entering aquatic ecosystems we end up with rampant algal blooms and one consequence of these rampant algal blooms is that it can diminish the visibility in the water column making it very difficult for aquatic inhabitants to see one another.
05:52	So how might this increased murkiness effect visual sexual signals? An incident example comes from East Africa in Lake Victoria where scientists a few years ago were studying these beautiful fish called Cichlids. And what scientists observed was that increased eutrophication and increased murkiness in the water meant that females were no longer able to tell the difference apart between males of their own species and males of a closely related species.
06:23	As a result females were making mistakes during mate choice and they were actually mating with males of the other species resulting in hybrids and also the loss of biodiversity. And some of my own research further north in Europe on another species of fish; the three spined stickleback is also illustrative. So together with colleagues in Finland we showed that increased murkiness from the water as a result of algal blooms made it more difficult for female sticklebacks to properly assess potential suiters.
06:53	As a result females were mating with poor quality males who were also more likely to cannibalise the eggs the female leaves with him in his nest. Here it is important to point out that human activity not only effects visual sexual signals. Of course we all know that the human population is ever expanding and of course along with that there is also an increase in the number of cities and the expansion of urbanisation.
07:19	Indeed it has been estimated by 2030 that some 60% of the human population will be inhabiting urban environments and of course urban environments differ quite dramatically from more natural environments that wildlife might have evolved in. For one urban environments tend to be extremely noisy and secondly the buildings themselves can actually interfere with the transmission of acoustic signals.

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07:44	So we know that many urban wildlife communicate acoustically. Males of many species of birds for example sing to attract females for mating. It has been shown that some species of bird, such as this great tit here actually raise or elevate the pitch of their calls so they can be heard against the low frequency pitch of urban noise.
08:05	We see this not only in birds. There is also evidence that in frogs, for example the Brown Tree Frog, that males will also call at a higher frequency so they can be heard against the urban noise. It's not only pitch adjustment that is important. There is evidence for example in Noisy Miners, that birds may have to call louder in order to be heard and research done on another specie of bird, called the Silver Eye showed that males actually now sing less complex songs so those signals can travel further through the urban environment.
08:36	At the moment it is still unclear however these kinds of vocal adjustments might actually impact the attractiveness of the caller. Another consequence of human activity is the pollution of the environment with a whole range of different types of chemicals. Now particularly in the city are so called endocrine disrupting chemicals (EDCs).
08:55	Now these are a wide range of different chemical compounds. They include things like certain pesticides, some plastics and even some of the medications we would take or we would give to livestock. All of these have the capacity to potentially interfere with the normal hormone function of animals often at very low concentrations. Now alarmingly EDCs have turned up in the tissues of wildlife living in even some of the most remote regions on earth.
09:22	For example they have turned up in the tissues of crustaceans living in the world's deepest oceans, they have turned up in fish living adjacent to Antarctic research stations and of course turned up in the tissue of polar bears living in the Arctic. In an Australian context we know that EDCs are both an environmental and a huge health problem as well so this is underscored by health warnings against the consumption of tainted seafood and there is also concerns about the security of Australia's fresh water supply. Fears about contamination by EDCs.
10:00	Now most of these pollutants enter the environment through waste water effluent but of course agriculture can also be an important source. So countries such as Australia still use hormonal growth promotants to help increase meat yield in livestock such as beef cattle and some of these chemicals also end up in the environment and expose wildlife to these potential EDC.
10:22	Research right around the world including some of the research we have been carrying out in my lab have found or reported a whole range of different kinds of impacts in a wide sweep of different types of species when exposed to EDCs. They range from egg shell thinning in birds to genital abnormality in alligators and also disturbed reproductive behaviours. So as early as the 1950's researchers noted altered courtship behaviours in American Bald eagles that had been exposed to the pesticide DDT.
10:59	Now so far all of the examples I have talked about have highlighted how environmental changes can have a negative impact on reproduction but it is important to point out that it is not always bad news. So a local example comes from Bower Birds. So male Bower birds construct an elaborate bower out of sticks and twigs and they also decorate the front of the bower, the court of the bower with found objects.
11.22	Normally in the wild they would use colourful berries or flowers to decorate their bowers. You can see the male here has decorated his bower with found blue rubbish objects. And these blue objects are actually preferred by females. So by gathering these rubbish objects and decorating his bower the male is able to increase his reproductive success. Further afield in Europe researchers have also shown that Black Kites, a species of birds have started to incorporate white plastic materials into their nests.

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11:50	And scientists have shown that the amount of white plastic rubbish incorporated in to the nest acted as an accurate signal or an honest signal of the nest builders fighting prowess. So here's another example of how a species has been able to make use of human altered conditions. And of course an understanding of animal behaviour can also be used to effect positive conservation outcomes.
12:12	A really good example of this is seen in New Zealand in regards to the plight of this particular species of bird called the Takahe. The Takahe number have plummeted as a result of introduction of mammalian predators, specifically the Stoat into New Zealand. And what scientists did a few years ago was to actually give Takahe chicks to foster parent of another species of bird called the Purple Swamp Hen.
12:36	The purple swamp hens are from Australia and they have had an evolutionary history with mammalian predators and what scientists were able to show was that by rearing Takahe chicks with the foster parent swamp hens the chicks were able to learn how to recognise potential predators from their foster parents.
12:55 13:24	So I guess the main take home message is that human induced environmental change can impact reproductive behaviours and this can have consequences for sexual selection and ecological and evolutionary processes. It's very important to understand sex in an increasingly human dominated world so we can understand better why some species can flourish under human altered conditions while others flounder. Thank-you.