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CONVERSATION

In the field: an interview with Craig Franklin

Craig Franklin is a Professor at The University of Queensland, Australia where he investigates the physiological and behavioural responses of fish, frogs and reptiles to changing environmental conditions. He completed his undergraduate degree in Zoology and his PhD at The University of Canterbury, New Zealand, before undertaking postdocs in New Zealand, Australia and the UK. Franklin talks to us about his experiences working in field locations ranging from Antarctica to tropical Northern Australia.

How did your interest in Zoology begin?

I grew up in Christchurch, New Zealand, which is on the coast of the South Island. As far back as I can remember my father took me down to the seashore. There were crabs running across the sand and small clams or pipis as we call them in New Zealand. I found it fascinating. I suppose my first observations were of animals in rock pools in a little headland called Kaikoura, which is a Maori word that means food and crayfish. It is about a two-hour drive north of Christchurch on the east coast and we often went there during summer holidays. It had a rocky platform where you could go and see animals from anemones through to crabs and octopuses. I think what intrigued me most about those environments was that they were constantly changing with the tide coming in and out, and I found the diversity of life really fascinating. That was the starting point.

What did you study at university?

At school I loved physics and chemistry, in fact, we didn't have biology in the final year of school, so I was grounded in mathematics, chemistry and physics. It wasn't until I arrived for my first year at The University of Canterbury, New Zealand, that I really got exposed to biology. Initially I was focussed on a career in either medicine or pharmacy. I enrolled in first year biomedicine-aligned courses, but I had to do a course in zoology and it changed my life. The professor, Wally Clark, was a zoologist and he totally captured my mind. He was really expansive when he spoke about zoology and he was passionate and enthusiastic. I distinctly remember going home after a practical exam, which I had absolutely loved, and telling my parents that I wanted to become a zoologist. What really captured my imagination was physiology: how animals function. I graduated with a degree in zoology and then I did an Honours project where I picked my own research topic. I decided that I wanted to know more about the venom of the katipo spider, which is like the black widow spider. Then I stayed at The University of Canterbury to undertake a PhD with Bill Davison and Malcolm Forster, both fish physiologists, studying stress physiology and osmoregulation in salmon. During that time, Bill asked if I would you like to go down to Antarctica to study Antarctic fish, which is really a rhetorical question, isn't it? I went there first in 1985.

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How did you prepare for that field trip?

In those days, they trained you before you went because Antarctica was so remote. The poor communication and transport meant that it was extremely isolated. We did five days of training in the New Zealand Alps, where we learnt how to travel over ice, build and live in a snow cave, first aid, firefighting, ice rescue techniques and mountaineering. And we had lectures on what it was like to live in an isolated environment. There were also medical tests. Then, I had to prepare for the science as well. I had to pack up our gear to be shipped down there months beforehand, so that it was waiting for us when we reached Scott Base. That field trip was for eight weeks in the summer and Bill, Malcolm and I investigated metabolic cold adaptation in Antarctic fish. The place totally captured my mind. Going into the field really stimulates your curiosity and creativity. You experience the environment, which makes you think and question.

After arriving, we went into the field for two more days of survival training; we had to build an igloo or a snow cave for one night, cook our meals in the open and learn how to traverse sea ice, snow fields and crevasses. It was an amazing introduction to Antarctica and I acquired the necessary survival skills, because the weather can change so quickly. The rest of the time I lived on New Zealand's Scott Base. It's a small community and like living in a freezer in reverse, with big freezer panels on the outside of the huts and freezer doors. Inside it's warm enough to wear shorts and

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Craig Franklin measuring a restrained saltwater crocodile. Photo credit: Russell Shakespeare.

t-shirts. In those days, the only effective form of communication was by letter. There was a radiotelephone and on Sundays we were allowed one phone call home; but, if there were solar flares, the ionosphere was destroyed and you weren't able to call home. It was really isolated and I loved it.

Going into the field really stimulates your curiosity and creativity

What was your daily routine?

First, we had to drive in a snowmobile – which was a whole lot of fun – on the sea ice to fishing huts, where we would hopefully catch some fish to take back to the lab. Once we had made sure they were OK, we did some respirometry, swimming them in a flume in the lab, so we could look at their metabolism at these very cold temperatures. When you're in Antarctica you're totally engrossed in what you're doing. You're doing science and you have people around supporting you. It's an amazing privilege that all your meals are cooked for you. All you have to do is wash your plate, knife and fork and wash your clothes. Bill, Malcolm and I would take off occasional days and go to visit the historic huts on Ross Island. I've been into both of Scott's huts, Discovery Hut and Cape Evans. In the early days they were still being restored, so you'd go in there and you'd see all the provisions that were left, even hams and cans of food; it was literally like going back in time. I've also been in Shackleton's hut at Cape Royds, which is my favourite. It has a real sense of history and time; there are even newspapers from 1907–8. That was very special. I also did some mountaineering, going into crevasses, and we went to visit penguin rookeries.

Have you ever been let down by bad planning?

No, because you always need to have contingencies in place. A classic example is when we did a field trip to the Arctic station on Disko Island, Greenland. We went there to work on Greenland and Arctic cod, but the conditions were so warm that they had disappeared; the species that we had spent so much time planning to study weren't available. So, we changed tack and thought, 'What else can we do? Is there a different species?' We ended up with a better project in some regards by working on benthic species that couldn't swim away. I've never had a field trip that has been a failure. You can't afford to make a mistake, because field trips are expensive and people commit enormous resources and time to them.

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What are the most important things that you prioritise when you're planning a field trip?

Number one: start by making sure your research questions are right and are achievable. If they aren't well formed, you won't prepare properly. Two: fieldwork involves teams. You can't do fieldwork by yourself, so make sure your team is full of people that you enjoy working with that have complementary skills. Understand the expertise and abilities of your team members; they're your support network. The human dynamics are so important. You're in remote locations, the last thing you want to do is to be around people that you can't work with and can't rely on. Number three: give yourself plenty of time to plan and prepare for the field trip. It takes longer than you think. If you're using technology, as physiologists tend to do, you need to ensure that all the bases are covered, from the equipment through to chemicals and other consumables. You're in remote locations, the last thing you want to do is to be around people that you can't work with and can't rely on.

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Why do you work with saltwater crocodiles?

Saltwater crocodiles are the reason that I went to Australia. After I got my PhD I applied for a postdoctoral fellowship at the University of Queensland that allowed me to come to Australia to study saltwater crocodiles. Their underlying physiology is fascinating; whether it's cardiovascular, osmoregulatory or metabolic, locomotion or thermoregulation, they are a fascinating organism in which to ask amazing questions about their physiological plasticity allowing them to live in changing and variable environments. They've been around virtually unchanged for more than 70 million years and they survived the mass extinction event when the dinosaurs disappeared, which makes you think, 'What makes them so resilient to changes in the environment and climate?'

How did you learn to catch saltwater crocodiles?

About 18 years ago I was working on freshwater crocodiles in far north Queensland with a good friend and colleague, Frank Seebacher, and was fortunate to bump into a guy called Steve Irwin, who was known as the 'Crocodile Hunter'. He was training rangers and his team in catching saltwater crocodiles. Every evening we got together and chatted about crocodiles and life. After about a week, he had to leave, and he said, 'I would like to work with you, I'd like to support your research program and I can capture estuarine crocodiles that are 4.5–5 m long'. Australia Zoo, which is the Irwins' tourist and education facility, provides the team and expertise to catch these large animals safely. Since then we've probably caught around 400 animals, up to more than 4.5 m in length and we've never had a major injury. Stevo's capture technique is safe for us and safe for the animal.

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What approach do you use?

We arrive at our field site, these days it's the Wenlock River, and we're based at the Steve Irwin Wildlife Reserve. First, the Australia Zoo team goes along the river and looks for signs of crocodiles: footprints, places where they were basking. They then set traps in the river or on the riverbanks that are baited with large bits of pig and cattle to catch an animal. We usually set about 20 traps, each takes probably half a day for a team of four people to set up and the traps usually span more than 30 km of river. Every morning at 7 am we travel up and down the river in a boat to check the traps. Hopefully, at least one has gone off and we have a crocodile. Then, we report by satellite phone how many crocodiles we have caught, the approximate size of the animals and the locations. Next, we assemble the team, which can be upwards of 15–20 people and we go to each animal. When we arrive it's sitting in the trap and the first thing we do is put three ropes on the animal's top jaw. Two of those ropes allow us to pull the animal out of the trap and there are four or five people on each rope, because a large animal can weigh close to half a ton. The third rope only has one person on it and it is used to tie up the jaws. Once you've pulled the animal out of the trap it tends to death roll – spinning round and round – and if the person who's on the single rope is any good they use the animal's natural instinct to death roll to bind up the jaws. Then we jump on it. There is always a team leader and when they are sure that the jaws are secure they say, 'Croc team get ready'. Then there is a pecking order; you line up and then the first person jumps on the head, then the next person jumps on behind them, then someone else jumps on behind and so on, it's like a domino tackle on the animal that restrains it.

After we have ensured that the jaws are well secured and the animal blindfolded, we can get on with the science. We take length measurements, blood samples, we sex the animal, we take samples of keratin from the scutes (the body projections) and tissue samples, which we use for genetic analyses and to find out what the animals feed upon. The key focus is, however, to attach satellite transmitters or to surgically implant acoustic tracking devices, which allow us to record the animal's movements for up to 10 years. The devices are also temperature sensitive, so we get a measure of body temperature. We now have over 8 million recordings of body temperature from 195 animals. For some of those animals we have measurements of body temperature that span over ten years. It's an amazing dataset. If we want to understand the effects of climate warming, long term data are important, so we hope that moving into the future we will be able to see whether there are impacts of increasing temperatures on saltwater crocodiles and how they regulate their body temperature.

Do you ever recapture the same animal?

We recapture animals all the time. One of the animals that we tagged in August 2019 was an animal we caught first in 2008. We implanted a new tag, which means that we could still be recording data in 2028. Can you imagine having 20 years' worth of body temperature data from one animal? We don't know how long they live, but 70 or 80 years is a reasonable estimate. Each of our animals has a name and a number – the team from Australia Zoo likes to name every animal – and you can identify animals just by looking at them; they all have unique markings, scars, and colour patterns. We also put a microchip into every animal, then we scan the tag and know which animal it is. Some years we've caught the same animal 3 or 4 times, so we figure that it can't be that bad in a trap if they keep coming back. In total, we have tagged 195 animals and I would say that we have recaptured maybe 20% of those. Once you have recaptured animals multiple times you can get an estimate of population size, through capture–recapture analyses.

How do you manage to keep people well and happy in the field?

We have a base camp with a full-time cook for the team, which can be up to 25 people. When we're there the days are very long and it's very hot and humid. We are also doing pretty dirty work and the baits get rotten and smelly. Going back to camp where you can have a hot shower and a meal cooked for you is just fantastic. When you're there you need a lot of sleep; you can't afford not to be well rested doing fieldwork, because that's when you make mistakes. However, the camp is completely 'dry'; there has never been any alcohol and there never will be. You can't afford to take a risk. These animals are potentially dangerous and you are totally dependent on your team functioning at the top level, so no one can be suffering from the effects of alcohol!

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Which of your many fieldwork projects gives you the most satisfaction?

I think that running the world's largest and longest satellite and acoustic tracking programme on crocodiles is enormously satisfying. After Steve Irwin died, his wife, Terri, and I regrouped and decided that we wanted to make this tracking programme the biggest and largest there has ever been and I think we've done that. I'm immensely proud of this long-term partnership and the human aspect of the collaboration. You also form long-term relationships with the animals, undoubtedly some of them will outlive me; that's pretty satisfying. I also get great satisfaction from ensuring that our telemetry data are open access, so that people will be able to keep on asking and answering questions using the data going into the future.

Craig Franklin was interviewed by JEB News & Reviews Editor Kathryn Knight. The interview has been edited and condensed with the interviewee's approval.