ELLESMERE SWANSONG

The end of a lake?

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Lake Ellesmere is one of the icons of Canterbury. With an area of about 200 square kilometres it is the region's largest lake, and the fifth largest in New Zealand. According to geologists, Lake Ellesmere has existed in approximately its present form for about 8,000 years. Maori have fished the lake (originally called Te Waihora) for several centuries, and a European fishing settlement has stood on its shores since the 1850s. Lake Ellesmere is home to numerous species of fish and waterfowl, and is also one of New Zealand's most important eel fisheries. But soon, incredibly, this could all be over. There are now grave fears that the ecosystem of Ellesmere is about to collapse. In a few years' time the lake may be damaged beyond all recognition.

The sun is just rising as I arrive at the village of Fisherman's Point. Situated beside a river mouth at the south-western corner of Lake Ellesmere, the village is a rambling conglomeration of elderly-looking cottages and shacks. In the yellowish early morning sunlight, it looks like a ghost town – only the smoke drifting from one of the houses gives any clue to human habitation. As I get out of my car, a pig wanders up from the lake shore, and trots down the main street.

Fisherman's Point has seen the rise and fall of the Lake Ellesmere fishing industry. It was originally founded in the mid-1800s, and by the turn of the century more than a hundred commercial fishermen were making their living here by catching flounder and yellow-eyed mullet. By the 1950s, fish stocks had begun to diminish, and only about twenty fishermen were working the lake. And by the 1970s – when eels had become a financially viable catch – there were only a handful of commercial fishers left to harvest them. Until the 1980s, only licensed fishermen were allowed to own land at Fisherman's Point village.

I'd come to Fisherman's Point to see one of the last commercial fishermen on Ellesmere. No-one alive today knows the lake as well as Clem Smith. Clem was born and raised on the banks of the Waikewai Creek, one of more than 40 waterways that flow into Ellesmere. His father worked as a fisherman on the lake, and Clem grew up helping on his father's boat. Following in his father's footsteps, Clem eventually became a commercial fisherman on Ellesmere himself. He's been fishing the lake longer than almost anyone and is the only remaining commercial fisher living at Fisherman's Point. He's spent nearly every day of the last three decades working in his boat on the lake.

The day I visited was no different, and despite being a public holiday, Clem still had to complete the daily dose of hard physical work that's part of his job. I met Clem outside his cottage, and introduced myself. Years of lifting heavy nets have given Clem the handshake and physique of a retired wrestler. At first impression, he seemed like the type of chap you definitely don't want to upset. But despite his grizzled exterior, I discovered that Clem has a boyish enthusiasm for the lake and its wildlife, and he was soon expounding its magnificence. "I just love Ellesmere," he declared, as we looked out at the view from his front porch. "And I still love going fishing on the lake, even though I've been doing it as a living for 30 years."

Ellesmere is certainly worthy of his appreciation. In 1990 it was officially declared to be a wildlife habitat of international importance. In addition to this, Ellesmere's geology makes it entirely unique in New Zealand for a lake of its size. Rather than being inland, as with other lakes of comparable area such as Wanaka or Wakatipu, Ellesmere is situated smack dab on the coastline of Banks Peninsula, separated from the sea by just the thin strip of Kaitorete Spit. At Fisherman's Point the spit is particularly narrow, and the separation of lake and sea is only a few metres. Prior to the arrival of humans, the lake would periodically burst forth here, pouring itself into the sea like a gigantic bathtub being emptied. This sounds catastrophic, but the entire ecosystem of Ellesmere has adapted itself to depend on such events. The broaching of Kaitorete Spit enables new fish stocks to enter the lake, flushes out silt and other debris, and allows mature fish to escape to sea for breeding.

With the arrival of humans at Ellesmere, these catastrophic events have been circumvented. Kaitorete Spit is now broached in a controlled manner, and the lake is maintained at a more-or-less constant level. Pre-European Maori kept the lake at a depth of approximately three metres, providing an optimum environment for the fish and waterfowl they harvested. But in modern times the lake has been kept at an average depth of less than two metres. This has allowed more land to be used for farming, and has prevented flooding of the Lincoln and Prebbleton townships.

The intermittent nature of the connection between lake and sea provides Clem with his first job of the day. Low water inflows have meant that the lake has not been opened this year. As a consequence, he must release some of the eels from the previous day's catch into the sea, so that they can breed and eventually replenish the population in Ellesmere. The eels destined for liberation were kept overnight in a barrel at Malcolm Walker's hut, a few hundred metres down the road. As we arrived there, I observed a dozen not-so-lucky eels hanging from a whata in the back yard.

Malcolm was drying these eels prior to smoking them in the traditional Maori manner. He explained that eels prepared like this were once a staple of the district, but are now eaten only as a delicacy. "Wrap them in brown paper, and store them beside the fireplace," Malcolm advised. "They'll keep for a year like that."

Malcolm introduced me to his grand-nephew, Taura Martin. Taura works as a truck driver, but eventually hopes to become a commercial fisherman on Ellesmere. He's learning the trade by working with Clem on the weekends.

The barrel of live eels was hoisted into the back of a truck, and we drove along the dusty track to Kaitorete Spit. The eels were released onto damp shingle near the edge of the waves. Clem, Malcolm, and Taura watched like indulgent fathers as the eels gingerly sniffed the air, and then – detecting the scent of salt water – began to slither rapidly towards the sea. We caught a brief glimpse of them in the surf, and then they were gone. They had just begun a 2,500 kilometre journey back to the deep ocean trenches near Tonga where they were born, and where they will return to breed and die.

The life cycle of these eels is truly extraordinary. Their eggs hatch into minuscule leaf-shaped larvae (or leptocephalus) that drift for several years on the ocean currents between Tonga and New Zealand. When they arrive off the Canterbury coast, the larvae metamorphose into tiny 'glass eels' about six centimetres long. These swim into Ellesmere when it's open to the sea. After a few weeks they lose their transparency and become elvers—which, in due course, grow into full-size eels. A long-finned eel may take up to 100 years to reach maturity.

Eels have been caught in Ellesmere measuring over two metres in length, and weighing more than 40 kilograms. This kind of monster eel will regularly catch ducks as part of its diet. In one of nature's bizarre quirks, any mature eels not caught by fishermen (or liberated for breeding) will eventually attempt to leave Ellesmere under their own steam.

As we walked back along Kaitorete Spit, Clem described the autumn nights when the male short-finned eels make their bid for freedom. "They tend to go in large groups," he observed. "They wriggle up out of the lake, and then try to climb across Kaitorete Spit. The first group will only make it a short distance before they get covered in shingle and bogged down. But then the next wave of eels come along, and using the corpses of the first group as sort of a road, get a little further over the shingle before they die. And then the next wave of eels arrive, and they get a bit further still. And so on. Finally the last lot come along, and some of them make it. So you might have several tonnes of male short-finned eel trying to leave the lake in one night, and in the morning nearly all of them will be lying dead on Kaitorete Spit. Only a handful will have actually reached the sea."

As I pondered this extraordinary description, we arrived at Waikewai Creek where Clem's fishing boats are moored. His boats are aluminium-hulled, with a shallow draught, and surprisingly large motors. Such powerful engines are necessary not only to provide sufficient speed to traverse a lake as large as Ellesmere, but also to produce enough acceleration to get the boats planing on their hulls within a short distance. This second requirement was demonstrated in dramatic fashion as Clem and Malcolm started the engines, and we left the creek for the lake.

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When Clem was a boy, the creek was six metres deep at the entry to Ellesmere. But now – with reduced water flow over the last few years – it has silted up so much that it's barely 30 centimetres deep. Malcolm explained that we must get up enough speed for the boat to plane before reaching the shallow creek mouth. Otherwise, as he pointed out with admirable understatement: "We stop. Very suddenly."

Although I'd prepared myself, the acceleration was so dramatic I lost my footing, ending up sitting beside the fish hold at the stern of the boat. As we shot out of the creek, our vessel performed the sort of manoeuvre more usually associated with jet boat operators, trying to frighten tourists. "It's a bit tricky here," shouted Malcolm, as the centrifugal forces threatened to push me overboard. "You've got to know just what you're doing."

It was only when the boat was hurtling across the surface of the lake – and I was starting to develop the first symptoms of hypothermia – that I began to get an appreciation of the vastness of Ellesmere. Two hundred square kilometres is a lot of space. The lake appears to stretch out to the horizon. I could easily believe that once a hundred or more fisherman worked there without overcrowding.

After only a few minutes the boats stopped at the first eel net. Clem and Taura lowered themselves over the side, wearing bib-type dry-suits. The shallow lake water only just came to their waists. They quickly lifted the eel net, and passed it aboard to Malcolm who emptied it into the fish hold. The eels writhed like boiling silver, as Malcolm carefully sorted through the catch, and then threw the undersized specimens back into the lake.

Looking at the size and vigour of the eels, it was hard to believe the findings of Environment Court Judge Jeff Smith. In a recent case, Judge Smith declared Lake Ellesmere to be eutrophic – so polluted by nitrogen and phosphate compounds that algal growth has become over-stimulated. This is a hazardous state for a lake ecosystem. As the rampant algal growth decomposes it causes a reduction in the dissolved oxygen content of the lake water. In fact, oxygen levels can become so low that fish life is unable to survive. Fortunately for Ellesmere, the lake is able to receive sufficient additional oxygenation via its own wave action. However, if the lake were any less windy, or any less shallow, then much of the aquatic animal life would be at serious risk.

This alarming state of affairs has prompted headlines declaring Lake Ellesmere to be 'technically dead'. While this claim owes more to newspaper hyperbole than science – the lake is not dead, technically or otherwise – there's no denying the lake's wildlife is suffering the consequences of severe environmental degradation. Investigations by the National Institute of Water and Atmospheric Research (NIWA) show that both the number and growth rate of Ellesmere's long-finned eels have diminished significantly over recent years. Poor water quality has driven other fish species almost to the verge of extinction. For example, the number of spawning brown trout recorded in Ellesmere's inflowing waterways has declined from 65,000 in 1949 to only 87 in 2004.

The eutrophication of Lake Ellesmere is due to a number of different factors. With a catchment of just under 2,700 square kilometres, Ellesmere is effectively a small puddle at the end of a massive sewer drain. Much of the fertilizer and animal waste that's washed off pastures within the catchment area ends up in the lake, as well as the run-off from roads and industrial areas via the stormwater system. Not only that, but the wetlands surrounding the lake – which previously acted as a partial filter to the incoming flows of water – have been largely destroyed by encroaching farmland. And all this is complicated by the fact that – as Judge Smith observed – the "Lake levels [are] manipulated for farming, rather than natural values".

Despite his optimistic words, he readily acknowledges: "If we can't make the necessary improvements, then the lake is really in trouble."

The reduced lake depth of modern times is less conducive to a healthy ecosystem, and provides much less flushing and scouring during the broaching of Kaitorete spit.

Clem is very concerned about the deterioration that he sees in Ellesmere. "The lake is sitting on a knife edge now," he told me. "You get the feeling that it's just teetering on the brink. It's the water inflows that are the most worrying to me. Ever since I can remember, it's only been in the height of summer that evaporation from the lake will beat the inflows, and you'll see the lake level dropping. But this last year the lake started dropping in September – months earlier than normal."

Low water inflows may well be the final nail in the coffin for Ellesmere. A reduction in water inflow means that the pollutants in the lake and its waterways are less diluted. Under the current management regime it also means that Kaitorete spit will be broached – and the lake flushed out – far less often.

What has caused the water inflows to be reduced? Judge Smith found it due to excessive amounts of groundwater being pumped from aquifers in the countryside surrounding Ellesmere. This has depleted the spring-fed lowland streams, providing the majority of inflow into the lake. The judge noted that over the last ten years, more than 40 new wells have been drilled in the area surrounding the Irwell River – just one of the feeders into Ellesmere. This has resulted in an extra 11 million tonnes of water per year being pumped out. To put this figure into perspective, the entire city of Christchurch uses only 50 million tonnes of water per year. The Irwell River has run dry in six out of the last eight years, whereas previously it had only run out of water during the occasional particularly dry summer. Judge Smith concluded that this is no coincidence.

So what will happen to Lake Ellesmere if the current circumstances continue? NIWA scientist Dr Clive Howard-Williams has studied the lake for many years, and is unequivocal about its prospects: "Ellesmere will continue to deteriorate". Howard-Williams says that urgent action must be taken to halt the lake's decline. "It definitely won't get better if we do nothing. Some intervention has to take place to slow the input of nutrients if we don't want the lake to get worse."

To this end the Waihora Ellesmere Trust (WET) has been formed. The trust has the support of Environment Canterbury, and consists of interested individuals and organisations, concerned about the deterioration of the lake. It includes groups as diverse as Federated Farmers, The Department of Conservation, Te Runanga o Ngai Tahu, and the Lake Ellesmere Fisherman's Association.

Jason Arnold is the co-ordinator of WET. "Ellesmere is clearly unwell at the moment," he says, "but our group has a lot of support from landowners and the rest of the community. Admittedly, we're struggling to get central government to commit to addressing the problems faced by the lake, but we're working hard to change this." However, despite his optimistic words, he readily acknowledges: "If we can't make the necessary improvements, then the lake is really in trouble." The trust's main emphasis at the moment is to produce a state-of-the-lake report updating the scientific research on Ellesmere.

Back on the lake, Clem and Taura had cleared the remainder of the nets. The fish hold was full of flounder – the main catch during the winter months. Today's eels would be liberated tomorrow morning.

The fishing boats returned to the Waikewai creek, and the catch was brought ashore. Clem took out his knife, sharpened it, and began to gut flounder at breakneck speed. "He's like Edward Scissorhands," Taura said admiringly. The flounder were carefully washed, and then packed in ice for delivery to customers. During summer Clem exports his eel catch as far as Europe.

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I asked Clem and Taura about the future. Does Clem have any plans to retire? "No way," said Clem, "I plan to keep on fishing until I drop." What attracted Taura to the lifestyle of a commercial fisherman on Ellesmere? "All you've got to do is look at the view out here to answer that question," he replied.

Inevitably, the conversation turned to the question of whether there's any future for them on Lake Ellesmere. "The thing that frustrates me," said Clem, "is that everyone knows that the current situation isn't sustainable. There are far too many water rights being issued, and we can all see the effect it's having on the rivers and everything else. It reminds me of the fishing industry in the 70s and 80s. Everybody knew that stocks were over-fished, but people were still being encouraged to invest. And then when it all collapsed, a lot of people lost their livelihood and jobs."

The scientists at NIWA would make a similar point in a different way. They say that Lake Ellesmere should be viewed as "A beacon which indicates how well we are maintaining the land". It's rather obvious that – by this standard – we're not being very sustainable. This has implications not only for the destruction of New Zealand's natural countryside, but also in terms of international trade. The Parliamentary Commissioner for the Environment has recently pointed out that future entry into overseas agricultural markets may be dependent on meeting their standards for sustainable farming practice: "It is important to consider what would happen if New Zealand farmers were required to comply with European standards to gain access to these markets. Recent research suggests that many of New Zealand's waterways would already fail to meet European Union water quality standards for nitrogen, and further intensification could exacerbate this situation." In this context, a polluted and eutrophic Ellesmere is clearly not going to be good advertising for the sustainability of New Zealand farming.

I watched as Clem gutted the last flounder, and then threw it into the fish crate. He rested for a few moments, looking out across the lake towards Mount Herbert. "It's unbelievable that they can't learn the lessons of the past about sustainability. And I'll tell you one thing – it's going to be tough luck for everyone concerned if the event that finally makes people sit up and take notice is the ecological collapse of Lake Ellesmere."

It's a sobering thought. In the meantime it might be a good idea for the rest of us to visit the lake, and remind ourselves how much we've got to lose. Don't wait too long though. Ellesmere may not have much time left. ⓐ