



Kuruma prawns, also known as Japanese tiger prawns, flourish in inland saline water and might prove a useful high-value summer crop for aquaculturists. NSW DPI

## A fish farming salinity solution

It is a little disturbing that the inland waters of the Murray-Darling river system are so saline in places that marine species can survive. However, Research Leader for Aquaculture with the NSW Department of Primary Industries (DPI), Dr Geoff Allan, and his colleagues, see inland aquaculture as a logical alternative land use in salt degraded areas. This is especially so given the shortage of suitable sheltered deepwater fish-farming sites along the coast.

‘Our R&D at the purpose-built Inland Saline Aquaculture Research Centre at Wakool, in western New South Wales, has been investigating the feasibility of growing marine and freshwater species in these salt-affected inland areas,’ Dr Allan says. ‘We see this integration of aquaculture and agriculture as a way of salvaging some productivity from degraded lands.’

The project is a collaborative initiative of the NSW DPI and irrigation company Murray Irrigation Limited (MIL), which has 1600 hectares of evaporation ponds near Wakool for salt interception and disposal. The engineering works control rising salinity by pumping the salty groundwater into evaporation ponds. There are 60 bores intercepting the groundwater and, over the 30 years that the scheme has been operating, it has returned more than 50 000 ha of previously non-productive, saline degraded land to productive farming.

The Murray-Darling Basin now has 11 of these interception/evaporation schemes and several more are planned or under construction. Even though they are resoundingly successful from an engineering perspective, the schemes are very expensive to build and operate. Economically viable aquaculture would be a big bonus to help offset the costs, while aquaculturists would benefit by having access to a water supply and disposal system via evaporation ponds.

‘Our research indicates that snapper, mulloway, black tiger prawns and kuruma prawns, as well as salt-tolerant freshwater species, notably rainbow trout which can tolerate both fresh and salty water, are able to survive and grow in saline water,’ Dr Allan says. ‘However, we had a rocky start. In initial tank experiments, the salt-water species all died in the Wakool water despite the similar salt content.’

‘NSW DPI Project Scientist, Dr Stewart Fielder worked out that this was due to the low potassium levels of the inland water (about 95% less than ocean water) which upsets the physiology of the marine animals. However, when we add potassium, in the form of potash, to boost concentrations to at least 40% that of seawater, the survival and growth of marine fish and prawns pleasingly match those in seawater.’

Two freshwater species, silver perch and rainbow trout, flourish in the saline

groundwater even without the addition of potassium. In fact, small-scale commercial production of trout has been underway at the aquaculture centre, for more than a year now, in six 0.5-hectare ponds ... and the farmed fish taste fine according to customers. Commercial partners are being sought to further develop trout farming using saline groundwater.

Apart from the low-potassium obstacle, there were initial difficulties with sulphur and other compounds in the sediments of the ponds (overcome by using a plastic lining) and with the harsh desert environment where the daily temperature range of pond water can be as much as 10°C.

‘Temperate marine species like snapper suffer during the cold winters, while rainbow trout are at risk during the hot summers,’ Dr Allan says. ‘Rainbows die if the water reaches 20–25°C, but we overcome this by adding freshly pumped ground water which has a low temperature of about 18°C. With a plastics company (Gale Pacific Limited) we have also developed a new type of low-cost pond cover which should give us a greenhouse effect to counter the cold winters for species like snapper and mulloway.’ Mr Grant Webster, Technician-in-Charge at the Centre, is currently testing these covers to assess their performance.

The project team is running large-scale trials with mulloway. These will include an economic assessment of inland saline aquaculture. There is also some confidence that the kuruma prawn will prove a useful summer crop for inland aquaculturists. Exported live to Japan, kuruma prawns can fetch \$50 per kilo or more.

Inland saline aquaculture is also being investigated in Victoria, South Australia, Western Australia and Queensland. The R&D activities are being coordinated through a National Aquaculture Council project, funded by the Fisheries Research and Development Corporation.

In an ACIAR project, Dr Fielder, has extended the concept to India, which also has millions of hectares of salinised land. There the giant freshwater prawn, which rapidly grows to 30 g or about 200 mm, is proving the prime candidate for inland farming using salty groundwater. In both countries, it is hoped that demonstrations of the pond-farming technique in real-life, commercial situations will lead to rapid transfer of the technology to other farmers.

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