



Mr Kourie holds a model of a single R-ended tank, showing the overhead walkway for easy access, and a copy of his book.

SALMON FARMING IN SA?

Research shows there's good potential along the Cape's West Coast

by Stephen McVeigh

SALMON are not being produced commercially in South Africa. Nor have they ever been farmed successfully, even on a small scale.

But there is reason to believe that with modern technology salmon farming could become a reality for SA, says Ramon Kourie of Intensive Fish Farming, Somerset West, in his recently released publication, *Potential For Atlantic Salmon Farming in South Africa*.

Atlantic salmon are being produced successfully in the Southern Hemisphere, notably in Chile, the Falkland Islands, New Zealand and Tasmania.

So why not SA? "The potential for Atlantic salmon farming in SA ... is well recognised and was recently documented by Hecht and Britz (1990) in their first report on the status of aquaculture in South Africa," says Mr Kourie.

It seems SA has a history (albeit a short one) of unsuccessful sea water fish culture, according to Mr Kourie's work.

Two sea water trout farms along the West Cape Coast were unsuccessful for technical reasons. A third is still operating, but its financial and production status is unknown to Mr Kourie.

Despite this lack of success in growing on of salmonids in sea water, Mr Kourie says developments over the past decade or so make it necessary to take a new look at sea water salmonid on-growing.

Trout and salmon production in sea water systems is essentially the same, both species sharing nearly identical environmental requirements during the growing out in sea water production systems, says Mr Kourie.

"The reason for the earlier failure of the two marine rainbow trout on-growing facilities on the West Cape Coast

has been attributed to engineering problems associated with the sites selected," says Mr Kourie.

The sea water systems used could be classified as first generation technology, he says. Nowhere in the world have such systems been successful. The farming of trout using appropriate second generation marine pump ashore tank farms is potentially viable.

The ability to satisfy the environmental requirements of rainbow trout at the successfully operating sea water growing-on farm near Saldanha Bay implies production of salmonids under local conditions can succeed.

Production of Atlantic salmon can be commercially successful given:

- The lower mortality of Atlantic salmon compared to that of rainbow trout at sea transfer (that is, when the fresh water-raised smolts are introduced to sea water growing-on conditions) and greater resilience to pathogens in the marine environment;
- The growth of Atlantic salmon is nearly three times faster than most strains of rainbow trout in sea water at salinities of 30-35 parts per thousand on dry feed;
- That Atlantic salmon exceeding 3 kg command a higher selling price at several market centres, including Billingsgate (UK) and Fulton Fish Market (USA), than portion sized trout (250-500g) or larger trout (less than 3 kg).

WATER TEMPERATURE

Possibly the greatest advantage for future local salmon producers is the application of a technically superior version of second generation, land based tank farms which are being used in Norway and Scotland — the traditional world leaders in salmon production.

Equally as important are the highly favourable sea temperatures off the south west and West Cape Coast lines.

Atlantic salmon grow at a faster rate in water temperature of about 16 C than at any other water temperature, says Mr Kourie. Optimum temperature range for farming Atlantic salmon in the marine on-growing phase is 14-18 C.

So the sea water tempera-

ture of the location selected for salmon production is important. The longer the sea water temperature remains within or near the optimum, the more successful and profitable the venture is likely to be because the fish grow more quickly and a multiple stocking and harvesting schedule can be more efficiently applied.

A comparison of mean, monthly sea water temperatures of the more important salmon farming locations of the world shows the South West Cape Coast from Cape Hangklip to Danger Point (especially Gansbaai) followed closely by the West Coast from Blouberg Strand to Port Nolloth and into Namibia (excluding the bays) are, in terms of sea water temperature, the two best locations in the world for farming salmon, says Mr Kourie.

"The South West Cape Coast appears to have a year round mean temperature of 15.3 C, which is closest to the optimum of 16 C (optimum range 14-18 C) for rearing salmon," says Mr Kourie.

Atlantic salmon would grow a faster rate on the South West Cape Coast, (followed closely by the West Cape Coast) than at any other destination.

Fish could be grown to almost 5 kg in just over 10 months using the Sunndalsora salmon strain.

Conditions off the West and South West Cape Coasts are rough and exposed, maximum wave heights potentially reaching or exceeding 10 m (from trough to crest). The few sheltered bays potentially available for cage farming, including False and Saldanha Bays, are either generally too polluted or have too high sea temperatures during summer (False Bay) or too great winter-summer variations (Saldanha Bay) to be suitable for high-efficiency salmon farming.

There are only two alternative approaches towards salmon farming in SA, says Mr Kourie:

- Floating off-shore or submerged off-shore cage culture or;
- On-shore tank farming using sea water pumped ashore.

Although off-shore cage farming of salmon seems a potentially viable option, Mr

SALMON FARMING

◀ Kourie is reluctant to recommend this because of the high risks of red tide, stock escapes, storm damage and the high economic penalties due to loss of quality and management control.

"Some of Norway's most prominent researchers have expressed their backing of the development of highly controllable and manageable on-shore tank farms," says Mr Kourie.

He, too, supports the idea of land based, pump-ashore tank farms using high-performance R-ended advanced second generation tanks for production.

The system is suitable for salmon, trout, red tilapia, sea bream, sea bass, eels and other high value fish where both fish quality and profitability are paramount.

There are several design advantages to the high-per-

formance tanks, says Mr Kourie. These include:

- Improved oxygen usage by the fish due to higher overall oxygen tension throughout the tank, this being attributed to the improved water mixing performance of the design.

This results in an almost homogeneous oxygen environment and lengthy in-tank water retention time;

- High stocking densities as a result of uniform in-tank physical and chemical water quality environment resulting also in near uniform fish distribution. This is due to the nearly complete mixing of old and new water, creating an almost complete homogeneous environment;

- In-tank velocity control to affect higher fillet yields, improved growth rates, improved muscle tone and texture to give a higher flesh quality and lower mortalities;

- Maximum use of floor/building space; pipelines, service and drainage channels; water supplies and common pond walls to effect a reduction in building material requirements;

- Single but maximum use of water before re-use (after being reconditioned) or discharge to produce regular and sustainable batches of high quality fish that have low mortality, equal feed conversions and growth rates;

- Simplified bath and flush medication procedures;

- Efficient mechanical feed distribution systems (more applicable on large farms using more than 100 t yearly) and low feed conversions due to frequent daily feedings, good feed spreading and excellent control possible over feeding in general;

- Efficient aeration inducing controllable in-tank current velocities and the capability of full stock support. At an average in-tank current speed of 0.4 body lengths per second (BL/sec) farmed salmon will cover 5 700-6 300 km over a 10-12 month on-growing

period.

This approximates the distance a salmon travels during wild migration. The aim of this process is to produce a fish that has the firmness and quality of the edible flesh of a wild salmon and is an improvement over farmed salmon in general.

- Fully self-cleaning systems which efficiently eliminate the settlement of faecal solids and improves their efficient removal.

The following is a simplified description of the tank system recommended by Mr Kourie.

"The configuration is rectangular, having rounded ends and a central dividing baffle around which a water current is induced, the overall effect being that of a continuous raceway offering the many husbandry and design advantages mentioned above.

VARIATIONS

"This configuration has many variations and has received various descriptive names. Intensive Fish Farming has termed this tank system 'rounded-ended' or abbreviated 'R-ended'.

The impact of rapid sea water temperature changes, caused by cold water upwelling, can result in unusually high stock losses in off-shore cage culture.

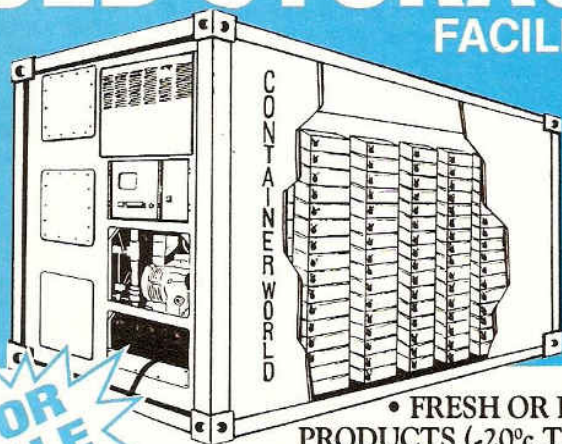
With a land-based pump-ashore tank farm, a "lengthy" retention time of sea water in the tanks will tend to buffer the rate of in-tank water temperature change, dramatically reducing the impact of rapid changes in temperature in the source water.

Possibly the greatest single threat to marine fish farms on the South West and West Cape Coasts is that of red tides formed by toxin producing marine algae.

The potentially shorter sea water rearing period of farm raised Atlantic salmon on both the West and South West Cape Coasts, compared to other salmon farming destinations of the world, could result in many advantages and few disadvantages, says Mr Kourie.

Despite ample availability of fresh water reared, large rainbow trout, true salmon are still being imported into SA, at least by two processors.●

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Tank farms could grow salmon in South Africa

FAVOURABLE seawater temperatures, efficient designs of land based fish farming tanks and years of research indicate that salmon could be successfully farmed along the coast of South Africa's Western Cape Province.

Although previous attempts to introduce seawater salmonid farming failed, there is good reason to believe that, using modern technology, it could now well become a reality for South Africa.

After six years of intensive research into the subject, fish farming specialist Ramon Kourie, has just released his book *The Potential For Atlantic Salmon Farming in South Africa*.

Atlantic salmon is already being successfully farmed in the southern hemisphere, notably in Chile and Tasmania. So why not in South Africa?

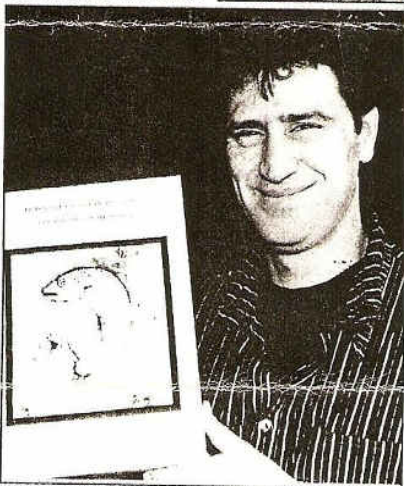
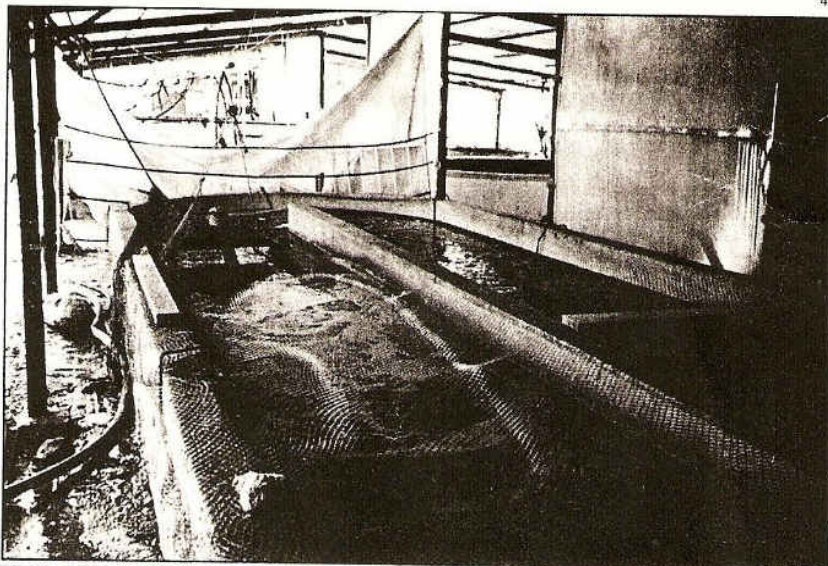
From Mr Kourie's work, it seems that South Africa has a history (albeit a short one) of unsuccessful seawater fish culture. Two seawater trout farms along the West Cape coast were unsuccessful for technical reasons. A third is still in operation, but its financial and production status is unknown.

Notwithstanding earlier problems with the growing-on of trout in sea water, Mr Kourie says things have so changed over the past decade or that it is now worth looking again at salmonid sea culture.

The seawater systems

Right: A battery of fish growing tanks at the National Centre for Mariculture Research at Eilat in Israel, similar to those recommended for salmon farming in South Africa.

Below: Ramon Kourie with his book on the potential for South African salmon farms.



used in the two failed seawater trout farms could be classified as first generation technology, he says. But farming using appropriate second generation marine pump ashore tank farms is potentially very viable.

Possibly the greatest advantage for future South

African salmon producers is favourable sea temperatures off the South-west and West Cape coastlines.

They could also have technically superior land based tank farm equipment which are now being used in Norway and Scotland, says Mr Kourie.

Atlantic salmon grow at a faster rate in water temperature around 16°C, he adds. The optimum temperature range for farming Atlantic salmon in the marine on-growing phase is 14-18°C.

Comparing the mean monthly seawater temperatures of the more important salmon farming locations of the world, he argues that the South-west Cape Coast from Cape Hangklip to Danger Point (especially Gansbaai) followed closely by the West Coast from Bloubaai Strand to Port Nolloth and into Namibia (excluding the bays) appear to be well suited for salmon.

However, conditions off the West and South-west Cape coasts could be described as being rough or exposed with maximum wave heights potentially reaching or exceeding ten metres (from trough to crest).

The few sheltered bays that are potentially available for cage farming, including False Bay and Saldanha Bay, are either generally too polluted or show too high sea temperatures during summer (False Bay) or too great winter-summer variations (Saldanha Bay) to be

suitable for efficient salmon growing.

Consequently the approach towards salmon farming in South Africa would have to follow only two alternatives, according to Mr Kourie.

These would be floating off-shore or submerged off-shore cage culture; or tank farming using seawater pumped ashore.

Risks

Although the off-shore cage farming of salmon seems to be a potentially viable option, Mr Kourie says he is very reluctant to recommend this because of risks of red tide, stock

escapes, storm damage and economic penalties when it comes to the loss of quality and management control.

He is therefore more in favour of land-based, pump-ashore farming, using the latest in tank and other technology. He points out that tank systems are now proving suitable for salmon, trout, red tilapia, sea bream, sea bass, eels and other high value fish where both quality and profitability are of paramount importance.

Further information, and copies of his book, are available from Ramon Kourie, Intensive Fish Farming, PO Box 430, Somerset West 7129, South Africa. Fax: +27 24 517768.

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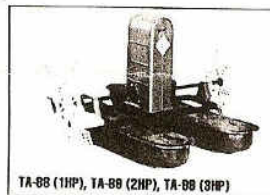
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