

Resistive Fish Counter

The Team

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Aims

- **To develop a cost effective fish counter for use the Murray Darling River system.**





Reasons

- Current methods of netting to quantifying fish numbers and species within the Murray Darling River system are expensive and time consuming.
- The ability to gather real time and continuous data on fish movement is important tool to aid in the understanding and evaluating of environmental issues on Native Fish in the Murray Darling Basin.



Background

There are a range of techniques available for monitoring fish.

Some techniques were investigated for the MDBC in the report

“Monitoring Fish Movements – Literature and Equipment Review”



Proposal

Our proposal to the MDABC was to further develop the Resistivity Fish Counter that was initially built for a 2000 student project.



Goals

- To develop a robust and economical counter.
- To count fish between 200mm – 600mm long.
- To operate in salinities from 300 – 800 Ecs.
- To operate in varying water depths.

The Resistive Fish Counter

The Fish Sensing Array



The Monitoring and Counting Electronics



Sensing Array

The array consists of two plates set 300mm apart through which the fish must pass to be counted.



Sensing Array Construction

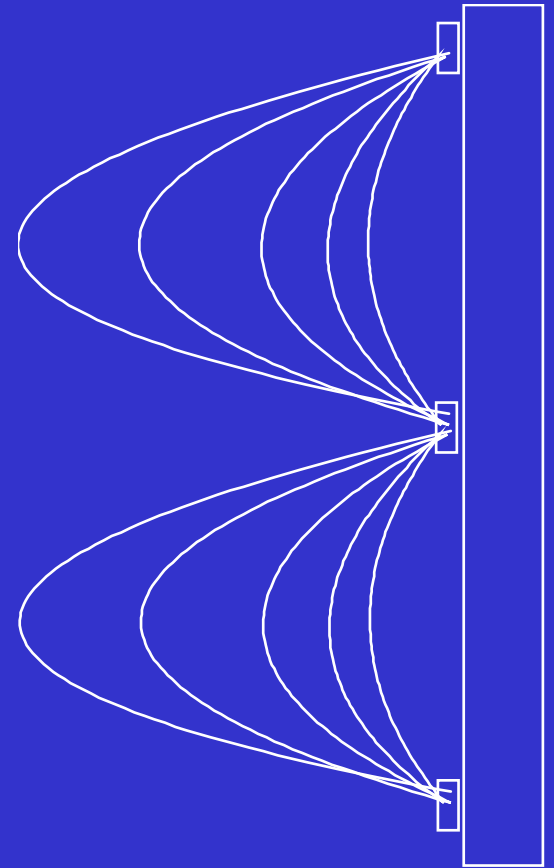
Each Plate of the array has three sensing element. The elements are 100mm apart and 200mm long



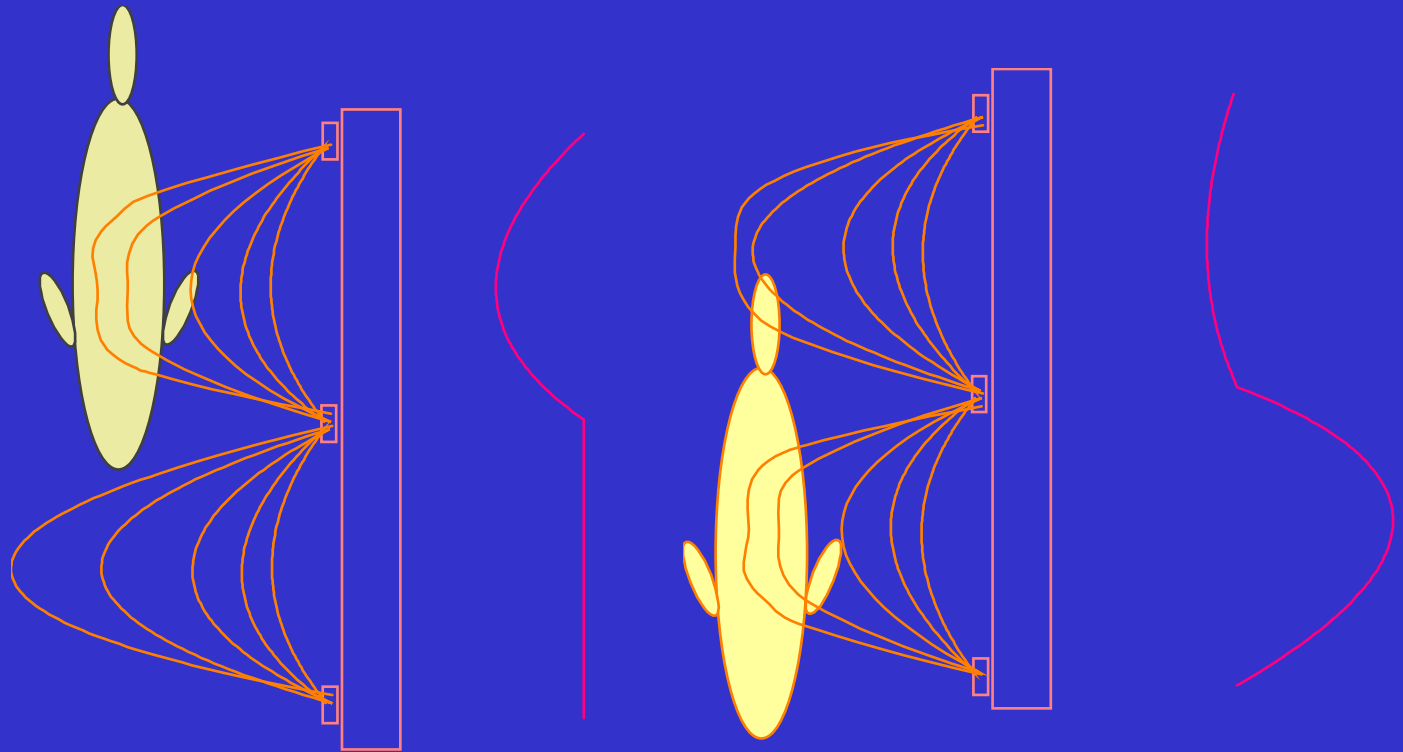
Basic Operation

(View from Top)

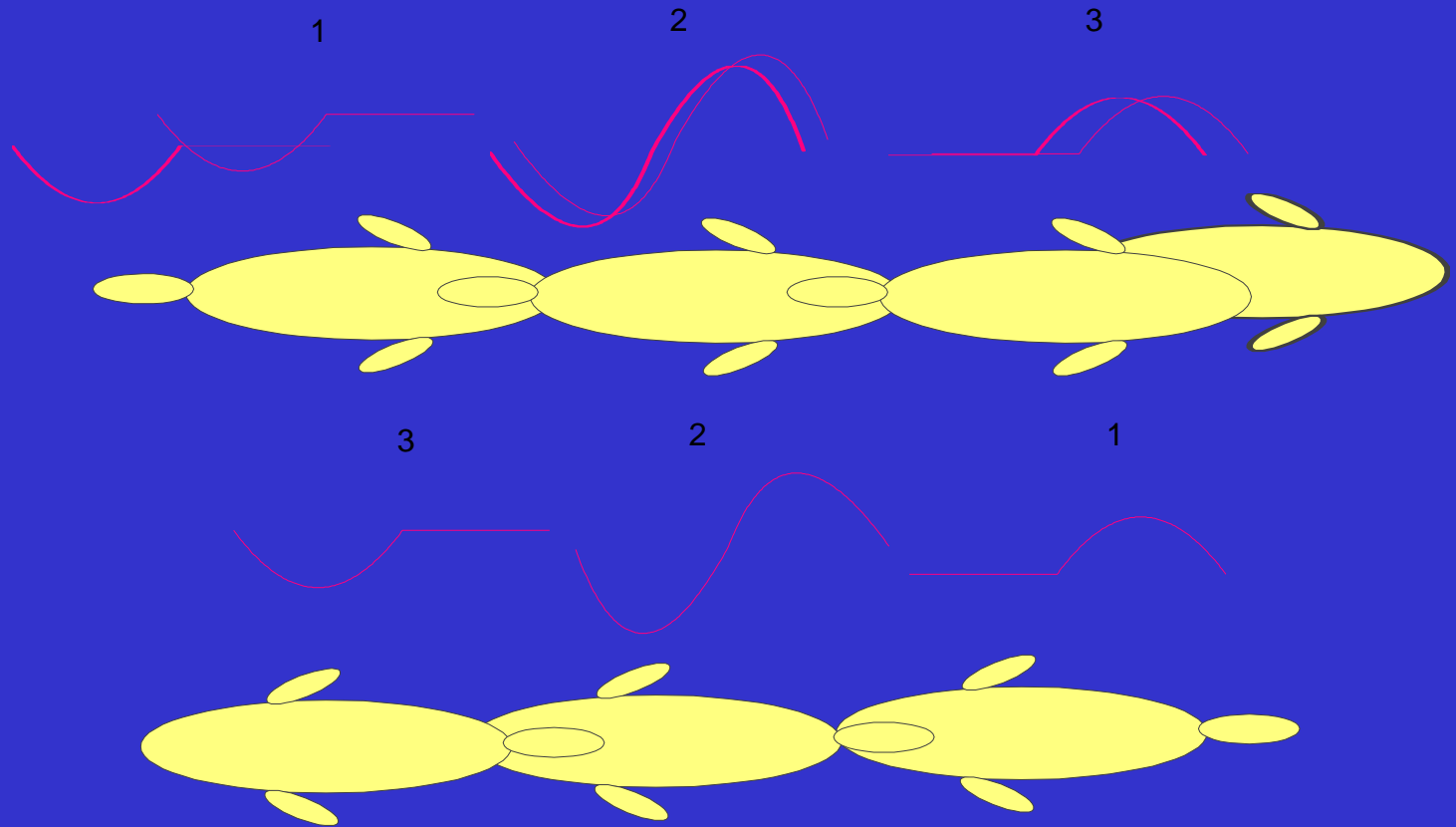
An AC electric current is produced between the external elements and the internal element. As a fish passes through the field the conductivity between elements is changed and detected



Fish Detection

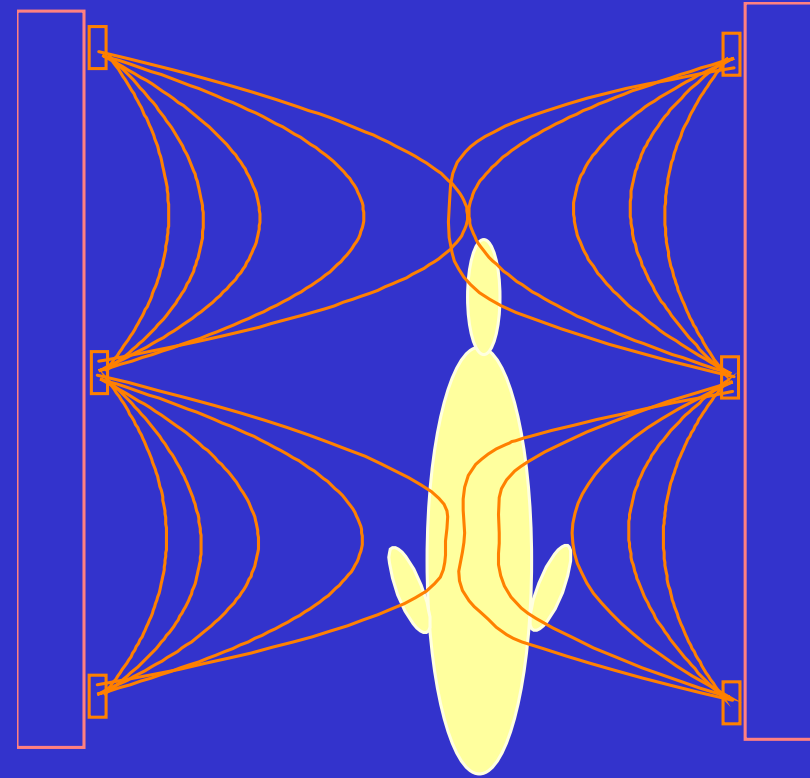


Fish Direction Identification

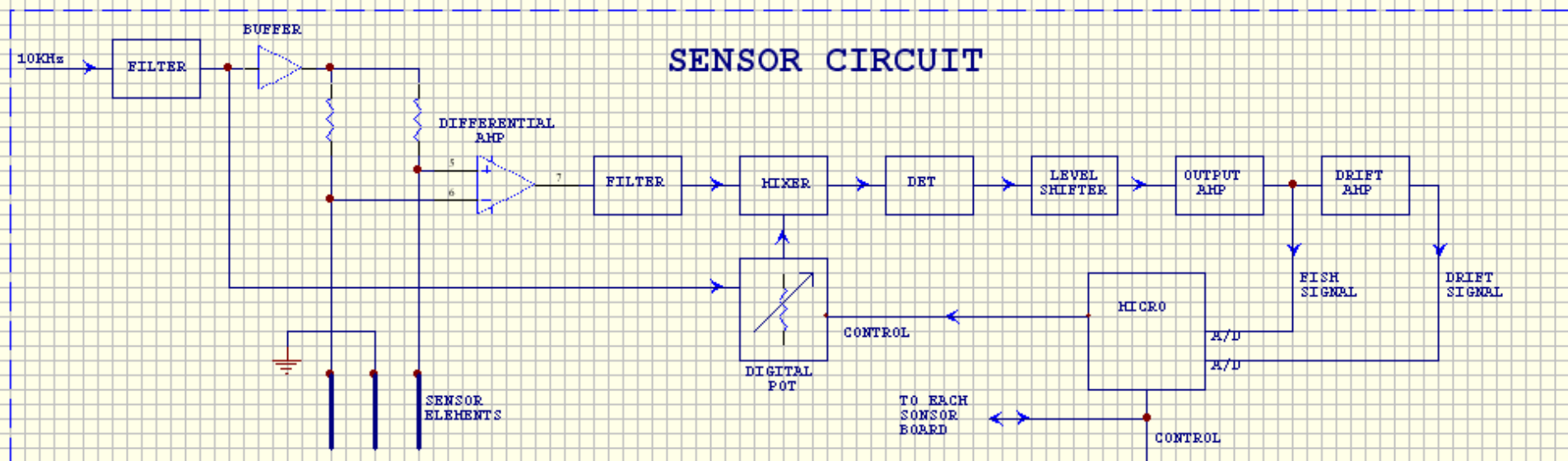


Array Arrangement for Fishway.

A two sensor array is used, where both sides of the element are in parallel and use common electronics.

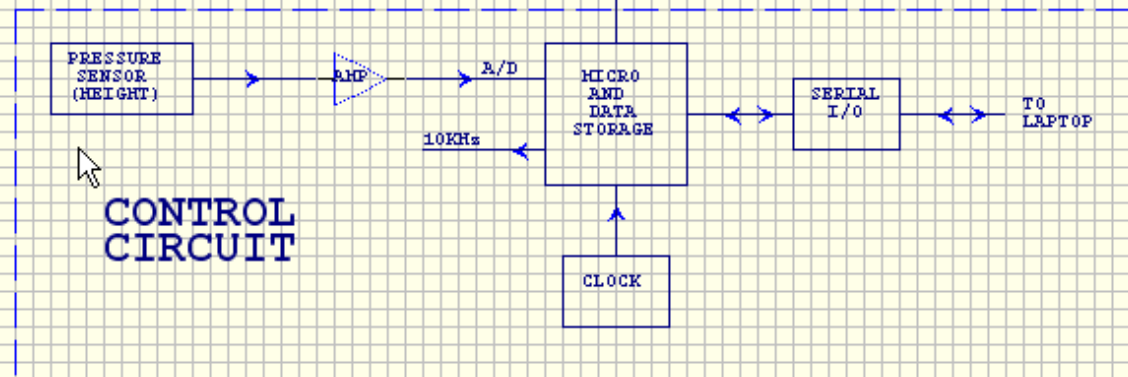


Hardware Block Diagram



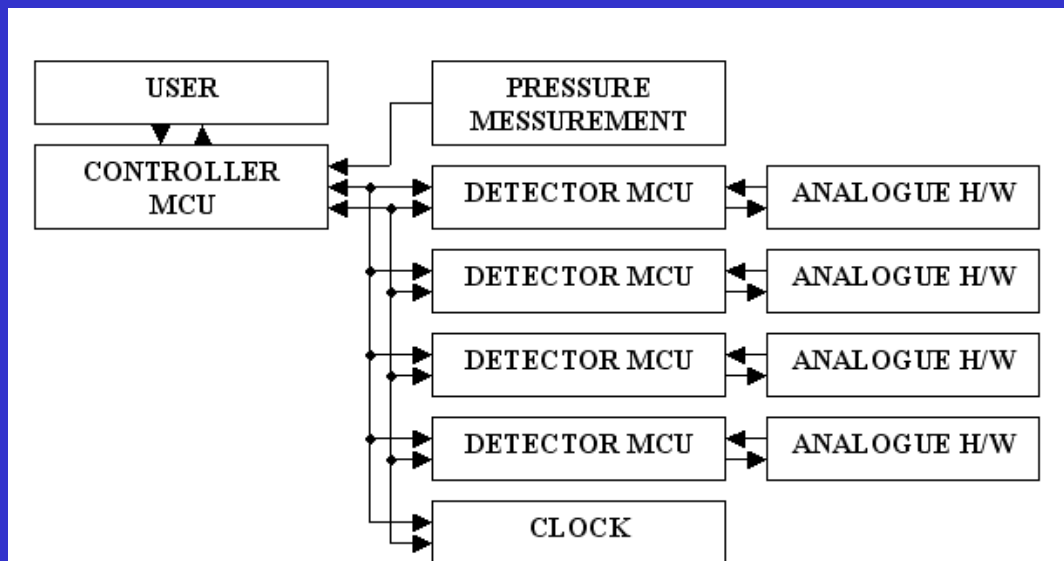
FISH COUNTING

BLOCK DIAGRAM



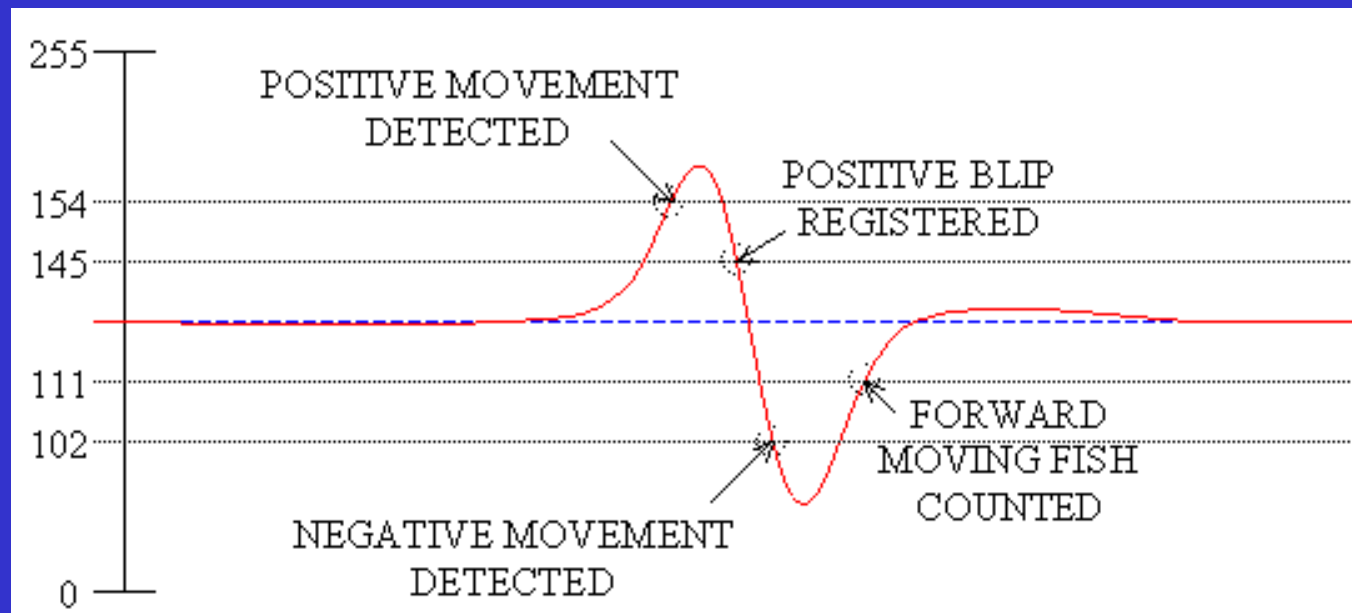
Controller (Master) Overview

- Continuously monitors the water level
- Downloads and saves the detector module counters every hour.
- User Interface to saved data.



Sensor (Slave) Overview

- Monitors and maintains the DC output level to compensate for changes in salinity.
- Uploads counters when requested by controller.
- Monitors AC waveform for changes and increments the appropriate counter.



Changes in Water Level

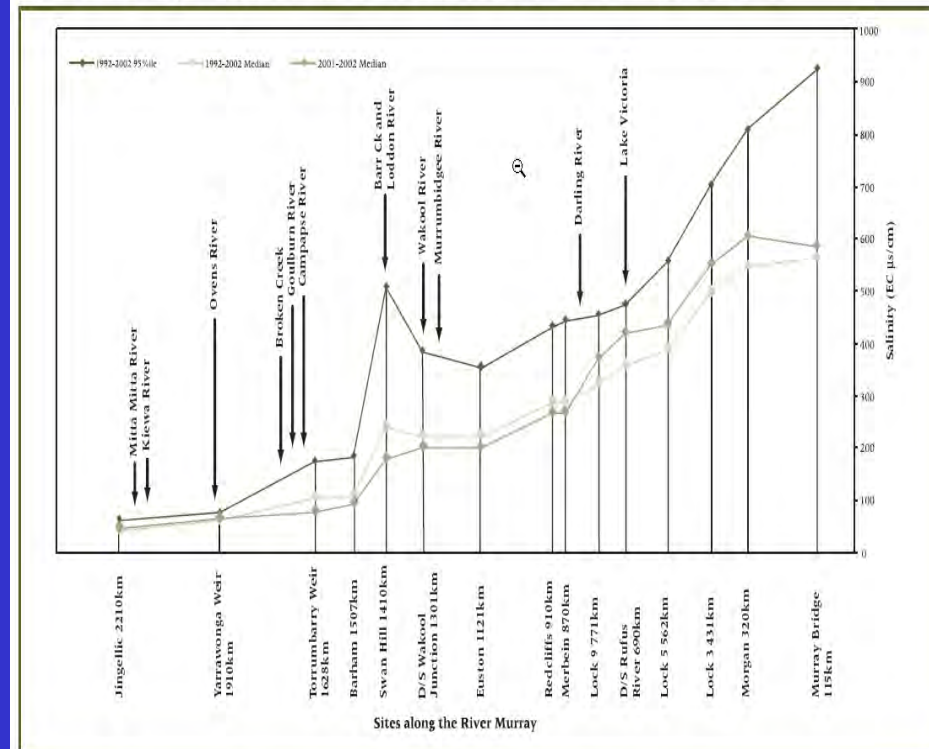
- The design of the sensor array allows for the division of the water column into 250mm increments



Salinity Correction

- The salinity correction is undertaken by continually monitoring the output from each array and adjusting for slow changes

Figure 3: River Murray Salinity Profile - 1992 to 2002 95%iles and Medians and 2001 to 2002 Medians





Readout

Startup

Enter current time>

Seconds (0-60)

Minutes (0-60)

Hours (0-23)

Days (1-7)

Month (1-12)

Year (00-99)

Readout

Response to Fetch Command

Hours	Forward	Reverse
0	7	2
1	19	11
2	21	10
3	18	12
4*	6	3

Current Time:01/06/2006 14:12:26

Startup Time:01/06/2006 10:47:35

Estimated Counter Cost

Single Array Element Counter	
Sensor Array	\$1400
Counter Electronics	\$1500
Solar Power Supply	\$3300
Modem Connection	\$800
Total System Cost	\$7000
Four Array Element Counter	
Sensor Array	\$2000
Counter Electronics	\$3000
Solar Power Supply	\$3300
Modem Connection	\$800
Total System Cost	\$9100

Note the saving if power is available on site

Trials at Tauwitchere Barrage

A four element array was installed at the Tauwitchere Barrage near Goolwa.



Tauwitchere Tidal Height Changes

The large tidal and wind driven water level differences made installation difficult due to deep water in the fishway and caused high flows through the fishway when the water level was lower.



Tauwitchere High Flows

The high flows caused vortexes to form down the front of the sensor array, this caused spurious counting and testing had to be abandoned.





Challenges

1. **Different fish species.**

An initial search for information on the conductivity of different fish species has produced almost no information, so it is unknown if some species may be transparent when passing through the sensor array as the system relies on a change in conductivity between the sensor array in order to detect a fish.

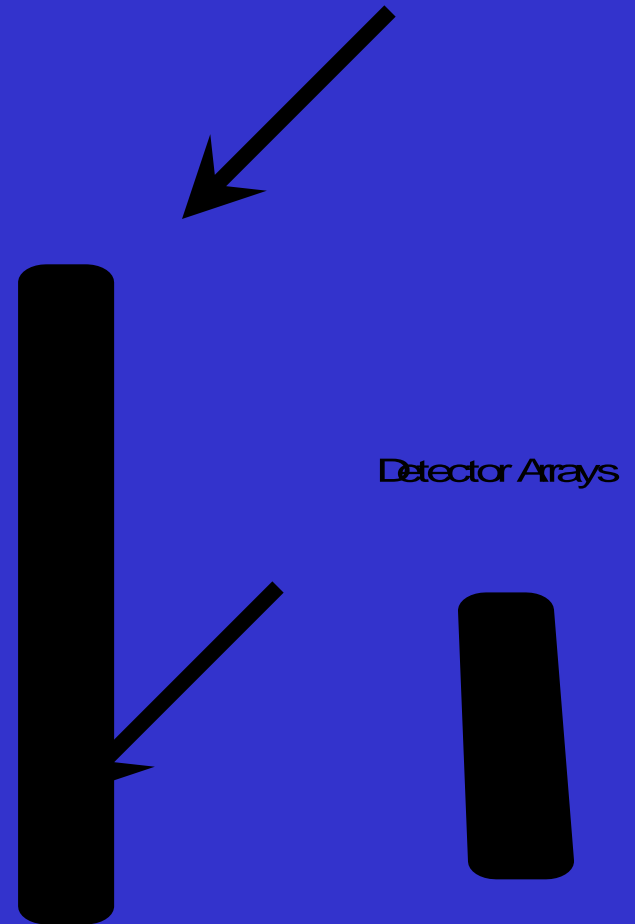


2. **Algal growth**

A long term installation may be effect by algal growth on or near the sensor array.

Further Trials

If trials were to be continued at Tauwichee then the sensor arrays would need to be moved into the basin to get away from the high flow at the entrance.





Preferred Trial Site

- A fishway that has a smaller headloss between the vertical slot bays (for example approximately 100mm)
- Not too far from Adelaide
- At a site that is regularly netted / sampled to gain a idea of the accuracy of the system
- A site that has power