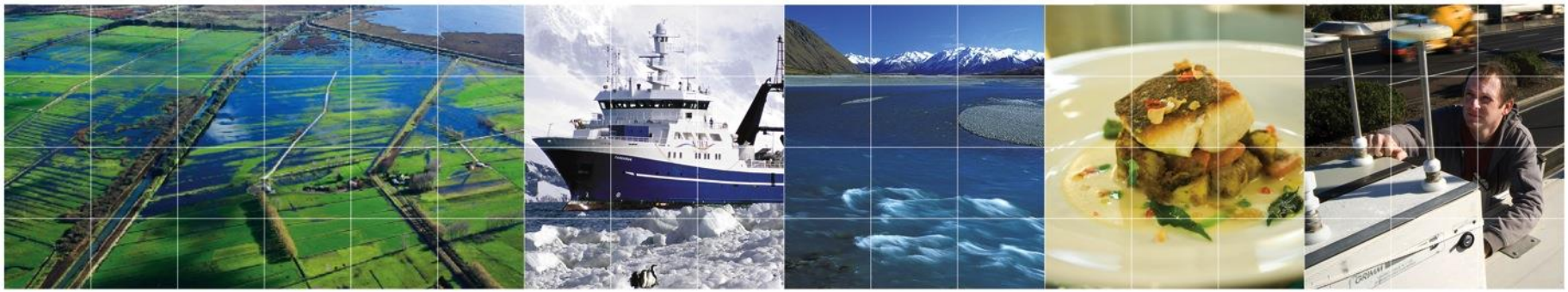
NIWA
Taihoro Nukurangi

Effects of the Ohau Channel diversion wall on smelt

David Rowe, Eddie Bowman and many others over 10 yrs



The Ohau Channel trout fishery

- When large flows of water go down the channel, high water velocities at the weir prevent the upstream movement of smelt.
- When a smelt run occurs and water velocity is high, smelt concentrate below the weir and this attracts trout, birds, anglers

ERFGC concern expressed in 2005: Will the diversion wall stop the upstream movement of smelt in the Ohau Channel and hence affect the trout fishery there? - Resource Consent required monitoring.

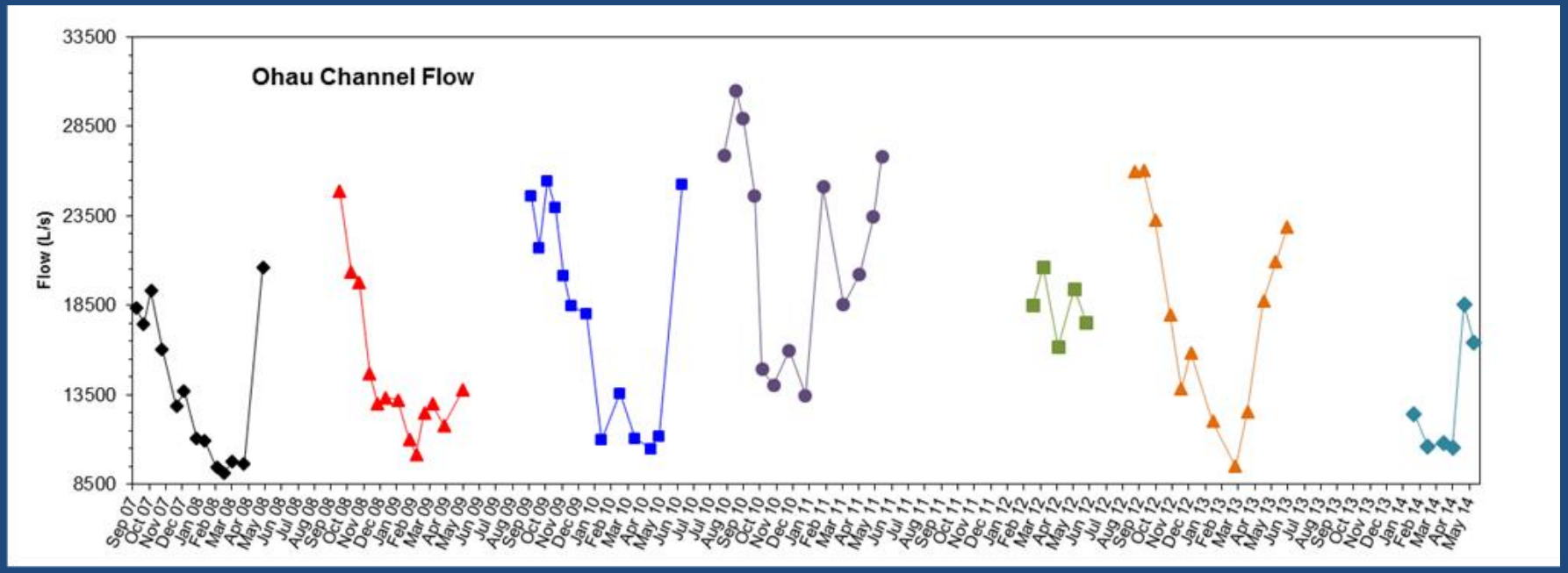
Smelt sampling in the Ohau Channel

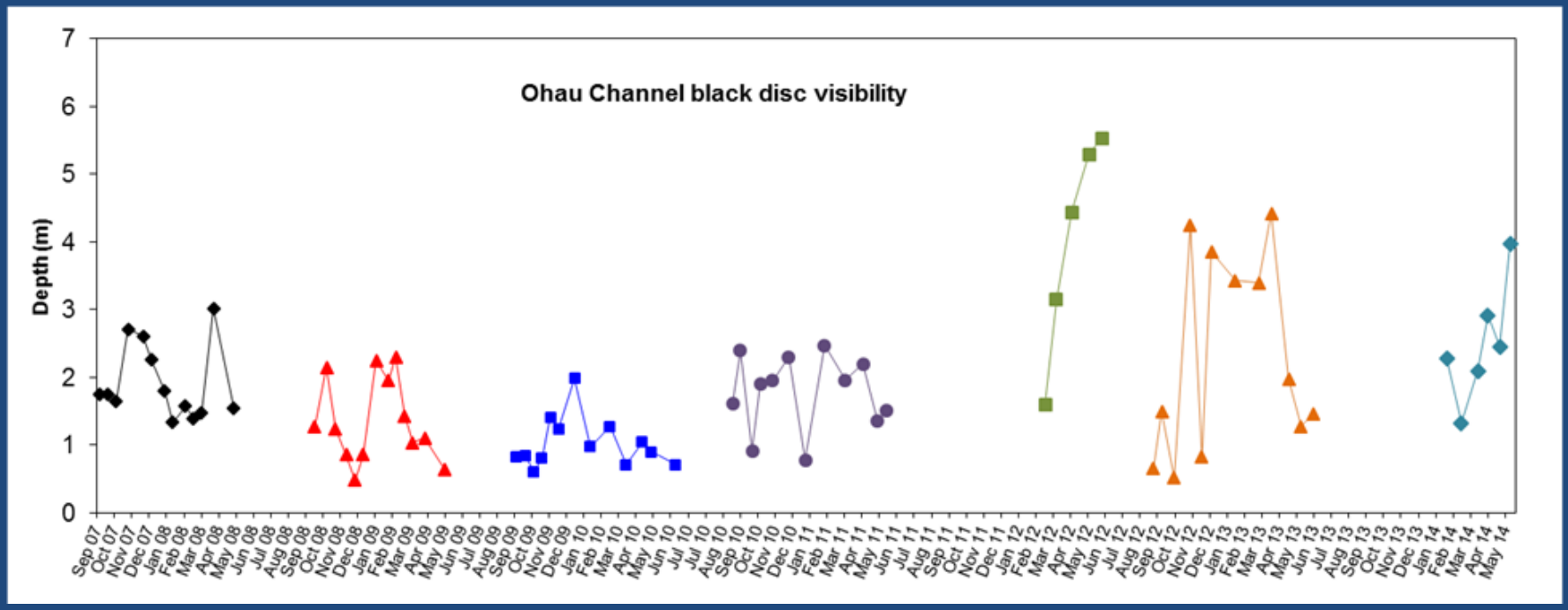
- 2 sampling stations (top of channel)
- Fine-meshed V-shaped traps close to river bed
- Sampling on 1 day every 3-4 weeks (Sept to May)
- Traps lifted every few hours over daylight
- Started in 2005, 3 years before wall installed

Water temperature, flow, water velocity, shag numbers, water clarity also recorded

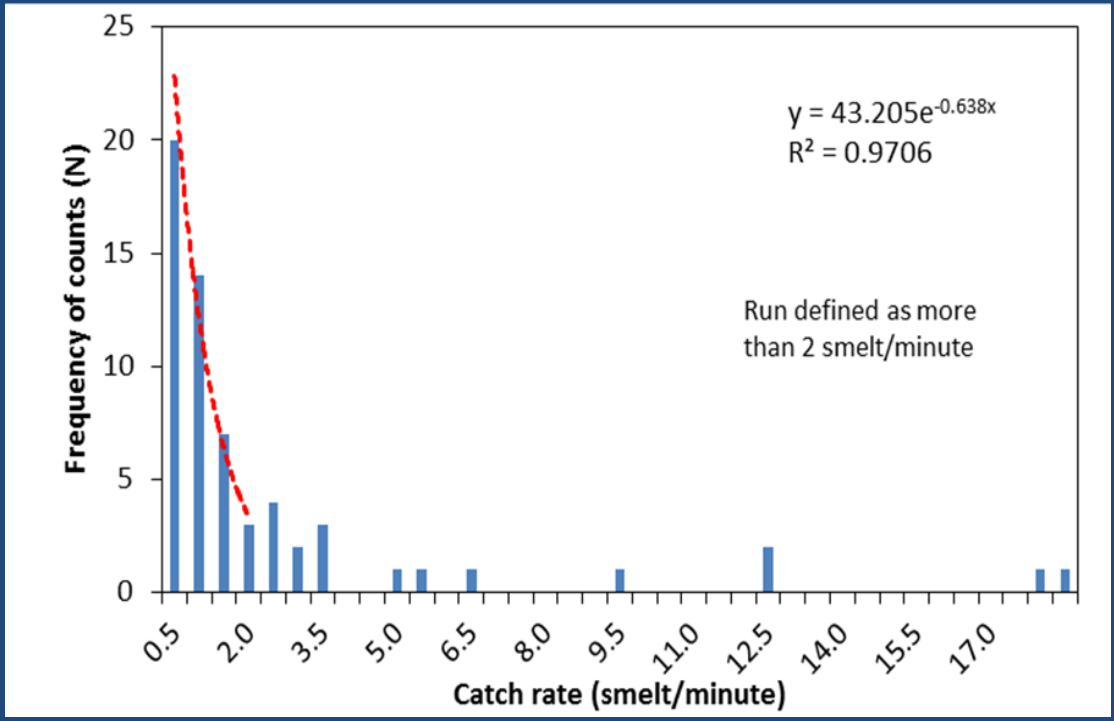
Trapping data on smelt backed up by daily observations from local anglers

Date	Observations by George Proud
11/03/2012	7.30am. Shags 10-20, herons 5-10, and many gulls. No smelt seen. No fishermen.
17/03/2012	6.30am. Shags and herons 5-10, gulls 10-20. No smelt seen. Two fishermen and fish caught.
17/03/2012	6.00pm. Shags and gulls 0-5 and herons 5-10. No smelt seen. No fishermen.
18/03/2012	7.00am. Shags 10-20, herons 0-5 and many gulls. A lot of smelt. Two fishermen and fish caught.
25/03/2012	5.30am. Shags 5-10, herons 0-5 and gulls 10-20. No smelt seen. Two fishermen and fish caught.
25/03/2012	7.00pm. Shags and gulls 0-5 and herons 5-10. No smelt seen. No fishermen.
30/03/2012	6.00pm. Shags and herons 10-20, many gulls. A lot of smelt. One fisherman and fish caught.
7/04/2012	7.30am. No shags, 10-20 herons and many gulls. No smelt seen. Five fishermen and fish caught.
7/04/2012	6.00pm. No shags or gulls, 5-10 herons. No smelt seen. Three fishermen, no fish caught.
8/04/2012	7.00am. Shags and herons 0-5, many gulls. No smelt seen. Five fishermen and fish caught.
14/04/2012	6.00am. Shags and herons 0-5, gulls 10-20. No smelt seen. Four fishermen, no fish caught.
14/04/2012	5.45pm. No shags or gulls, herons 5-10. No smelt seen. Two fishermen, no fish caught.
16/04/2012	6.00pm. No shags or gulls, herons 0-5. No smelt seen. No fishermen.
17/04/2012	6.30am. Shags 0-5, herons 5-10 and many gulls. No smelt seen. Six fishermen, no fish caught.
21/04/2012	6.00am. Shags and herons 0-5, and many gulls. No smelt seen. One fisherman, no fish caught.
21/04/2012	5.00pm. Shags 0-5, herons 5-10 and many gulls. No smelt seen. One fisherman and fish caught.
25/04/2012	5.00pm. No shags or herons and 0-5 gulls. No smelt seen. No fishermen.
11/05/2012	6.30am. No shags or gulls, and 0-5 herons. No smelt seen. No fishermen.
19/05/2012	7.30am. Shags and herons 0-5, no gulls. No smelt seen. One fisherman, no fish caught.
28/05/2012	5.30pm. No shags or gulls, herons 0-5. No smelt seen. No fishermen.
2/06/2012	6.35am. Shags and herons 0-5, no gulls. No smelt seen. No fishermen.
10/06/2012	7.30am. Shags and herons 0-5, gulls 10-20. No smelt seen. Ten fisherman and fish caught.
14/06/2012	5.15pm. Shags 5-10, herons 0-5 and no gulls. No smelt seen. Three fishermen, no fish caught.
16/06/2012	7.30am. Shags and herons 0-5 and no gulls. No smelt seen. Two fishermen, no fish caught.


Ohau Channel Flow
Flow (L/s)
33500
28500
23500
18500
13500
8500


Ohau Channel black disc visibility
Depth (m)
7
6
5
4
3
2
1
0

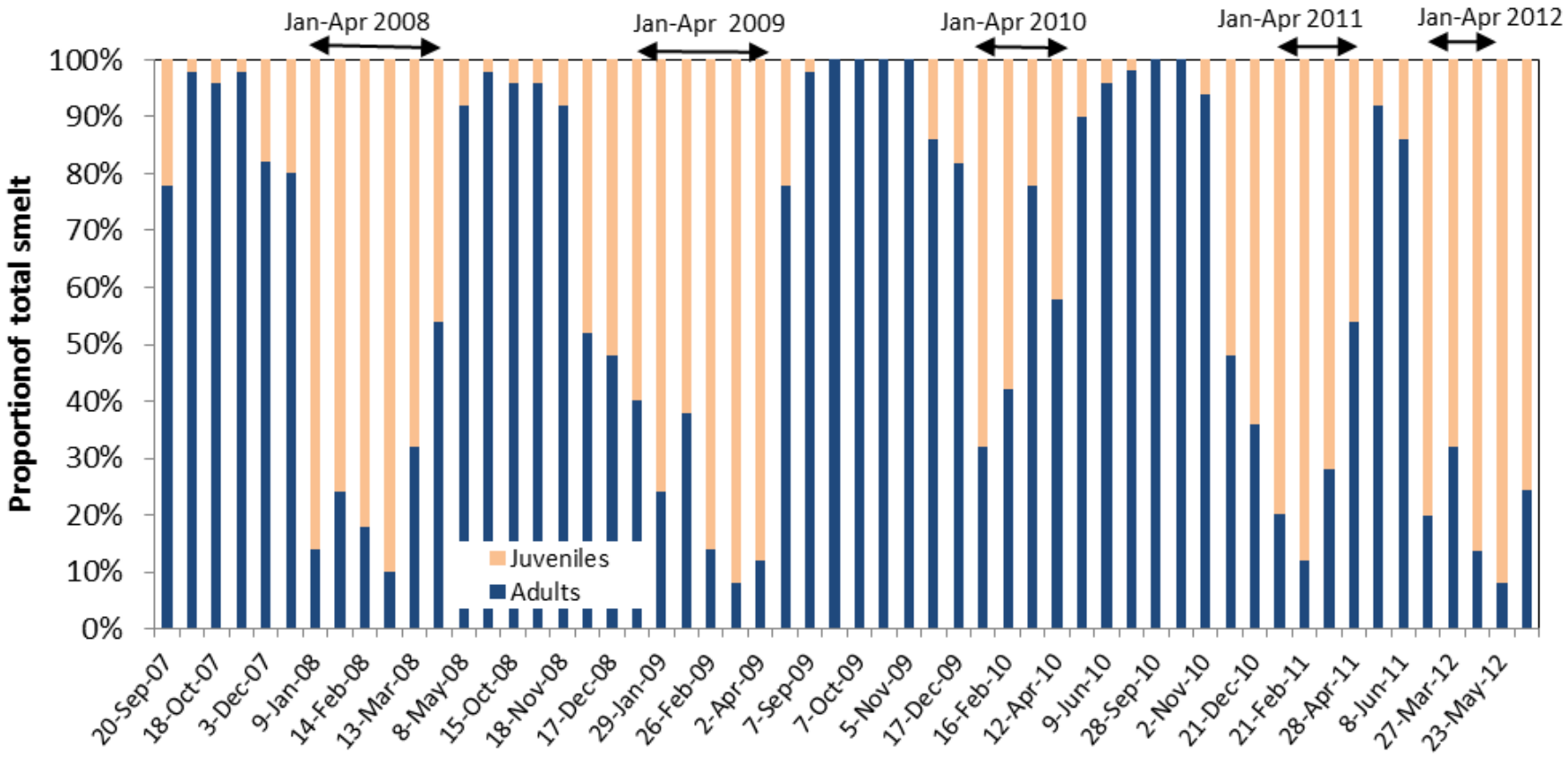
1. ‘Trigger’ level for a smelt run defined - based on both bank-side observation (Frank Thompson) and catch rates



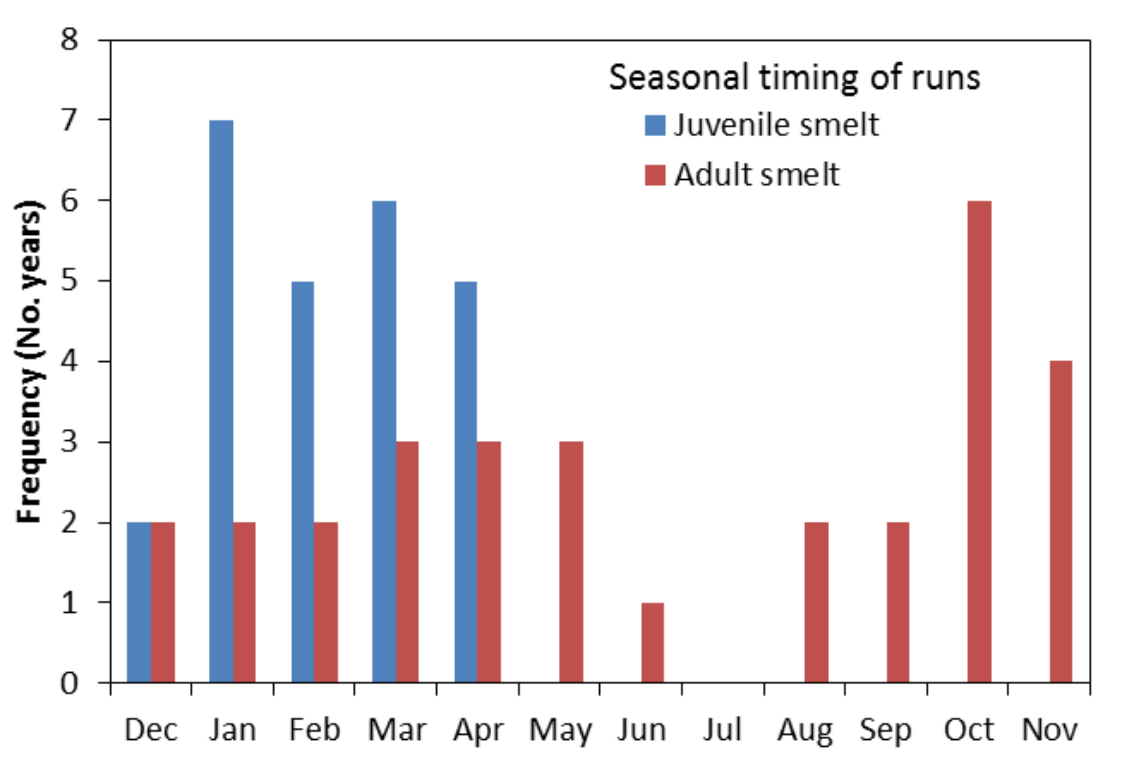
Smelt run = >2 fish/minute (= 3 shoals of 40 fish/hour)

2. ‘Trigger’ level for frequency of smelt runs not possible to define (large inter-year variation = insufficient pre-wall data)

Juvenile smelt (TL<45 mm) tend to predominate in summer (Jan-Apr), adults in spring (Sep-Dec)



Seasonality of smelt runs

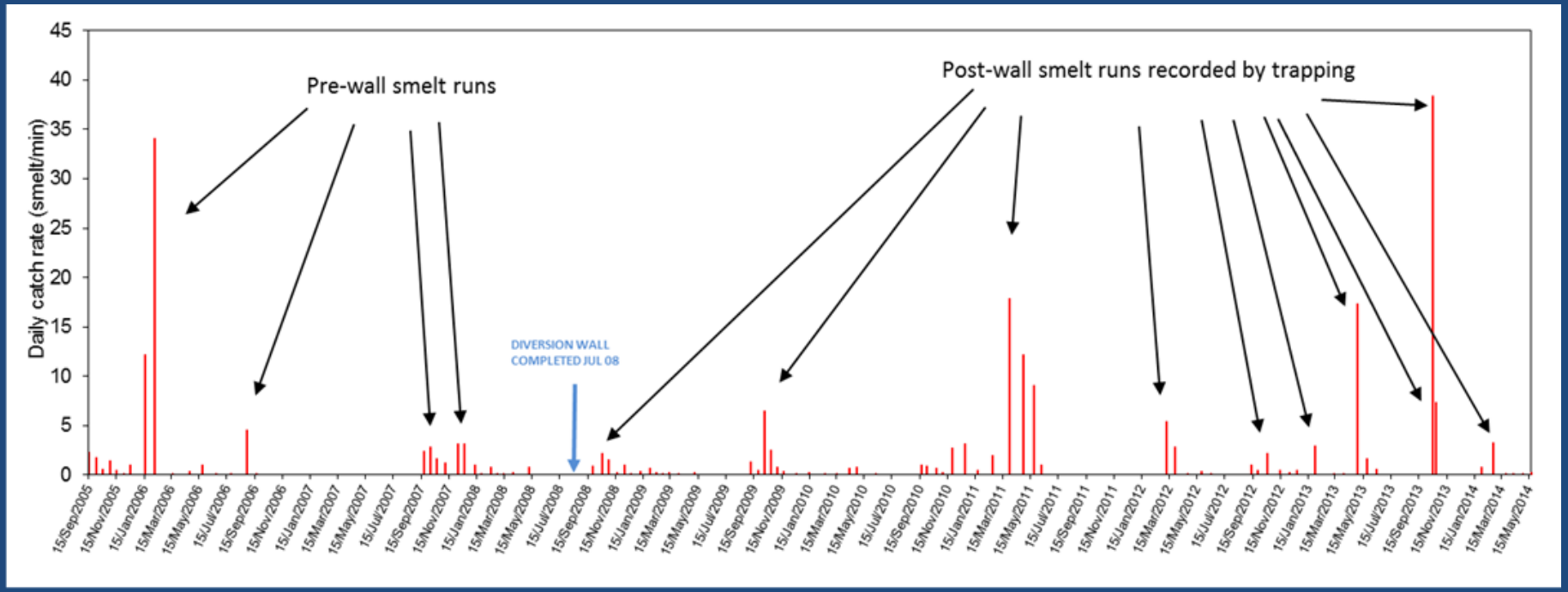


- Juvenile smelt runs only occur in summer months (Dec to Apr)
- Adult smelt runs occur in all months, but mainly in spring (Oct) and autumn (Mar to May)

Smelt runs up the Ohau Channel 2005-2014

Pre-wall runs
- Adults in 2006,2007
- Juveniles in 2006, 2007

Post-wall runs
- Adults in 2009, 2010, 2012, 2013
- Juveniles in 2011, 2012, 2013, 2014

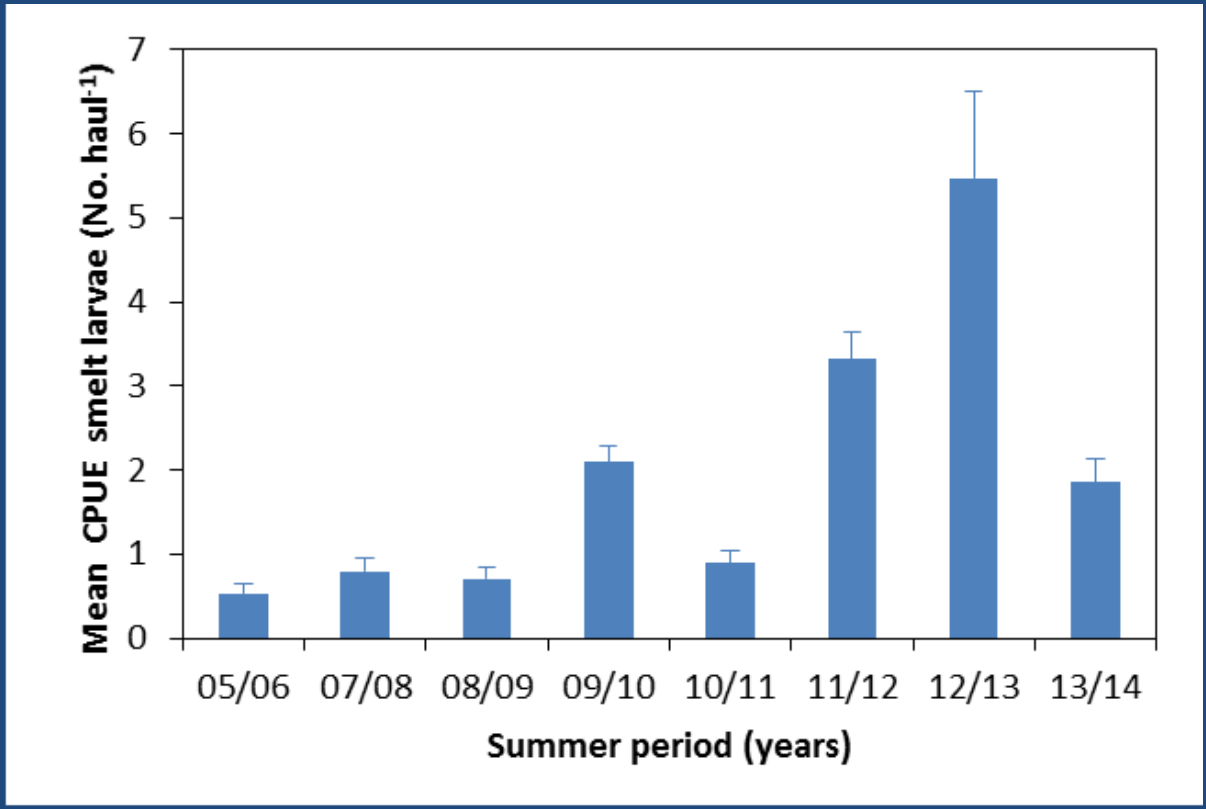


SUMMARY

- Runs of both juvenile and adult smelt have occurred in the Ohau Channel since the diversion wall was installed
- Relatively large runs (>10/min = 5-6 shoals of 100 fish/hr) of juvenile smelt occurred in 2011 & 2013, with a large run of adults in 2013. Largest run (35/min) recorded was in 2013
- Size or run varies greatly from day to day
- Duration of runs ranges from half a day up to at least 15 days
- Frequency of runs varies between years. Few if any runs in some years and many runs in other years
- Little knowledge of what triggers runs up the channel (not water temperature, clarity, flow rate, or moon phase….but sometimes adults are ready to spawn in Rotorua)

Larval smelt in L. Rotoiti

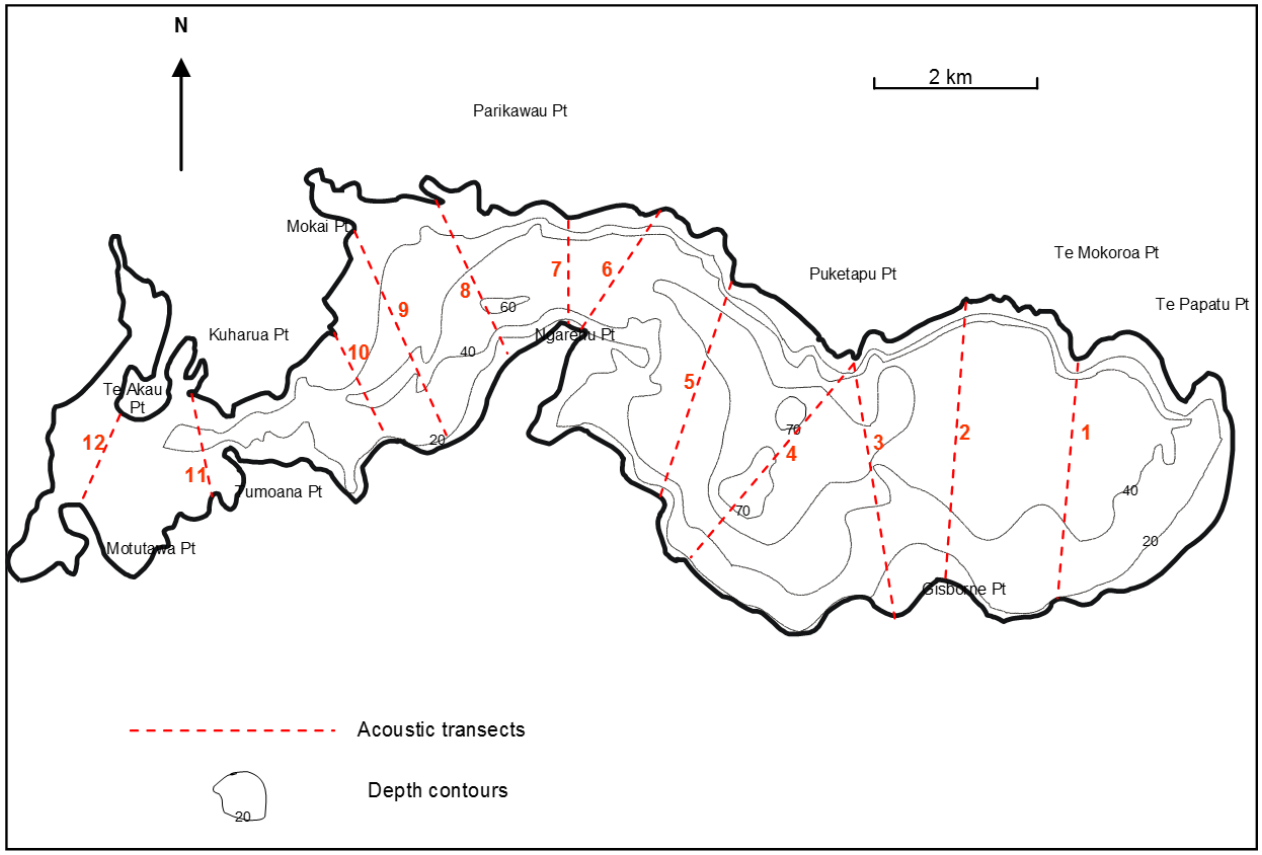
Annual changes in summer density (mean ± SE)



Improvement in water quality is increasing smelt recruitment in Rotoiti, mainly in deep eastern basin

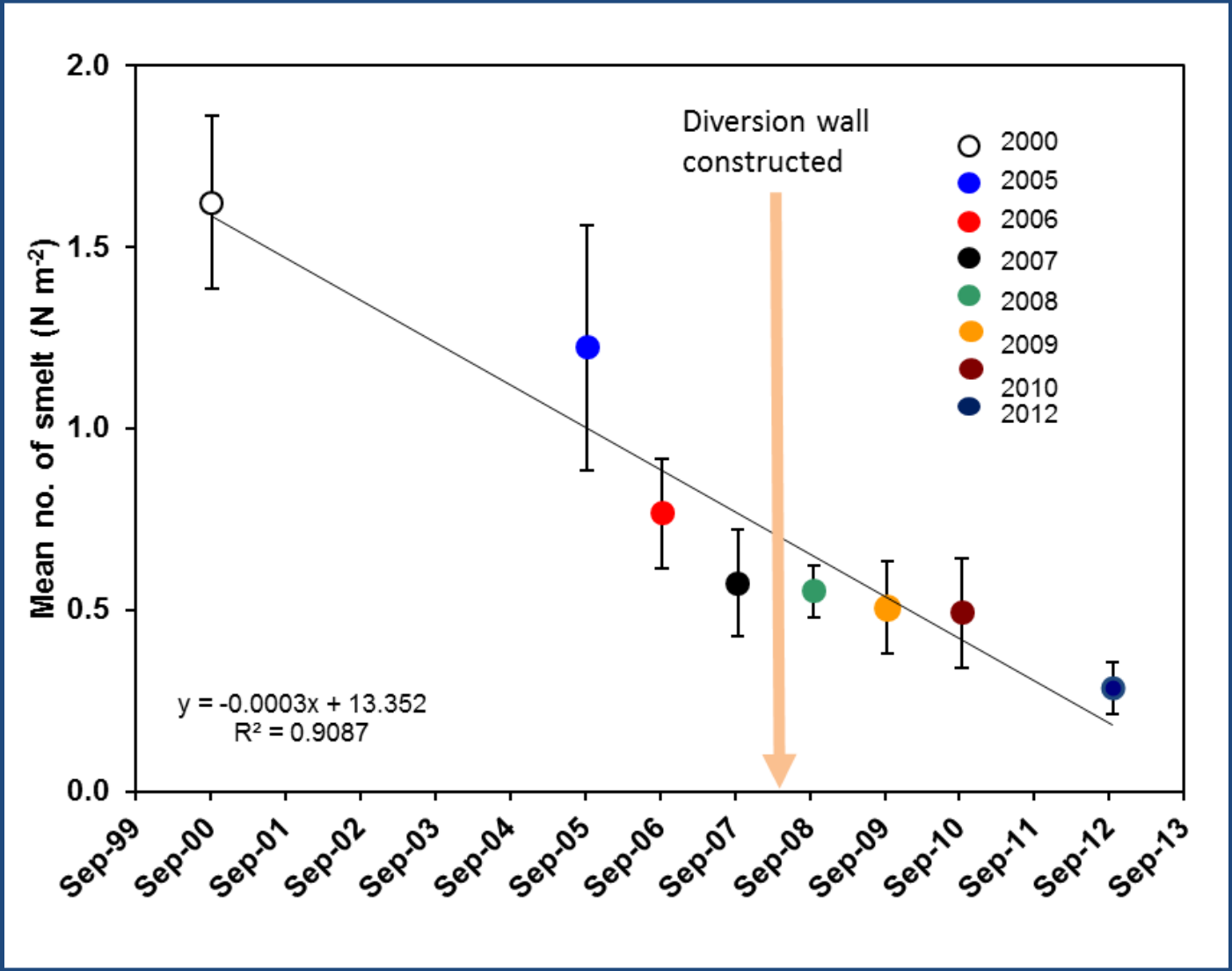
Adult smelt abundance in Lake Rotoiti

Acoustic surveys in spring (2000-2013)



Twelve transects to cover the lake and account for any major spatial changes in areal distribution

Long-term changes in the abundance of ‘adult’ (not juvenile) smelt in Lake Rotoiti



DIVERSION WALL – SUMMARY OF EFFECTS ON FISH

1. The trout fishery in Rotoiti has improved since the diversion wall was installed.

2. Both adult and juvenile smelt still migrate up the Ohau Channel to Lake Rotorua. No evidence for any large decline in daily run size, duration, or frequency

3. Larval smelt abundance in Rotoiti has increased since the diversion wall was installed. Adult smelt abundance in Rotoiti in September has not (at least to 2013)

4. Poor years in the trout fishery at the weir could be due to one or more of:
   - a reduction in the "right conditions" for the build-up of smelt behind the weir?
   - a change in the environmental factors that trigger smelt runs up the channel (but not water temperature, clarity, or flow rate)?
   - a reduction in trout below the weir when smelt concentrations occur there?