NIWA
Taihoro Nukurangi

Effects of the Ohau Channel diversion wall on smelt

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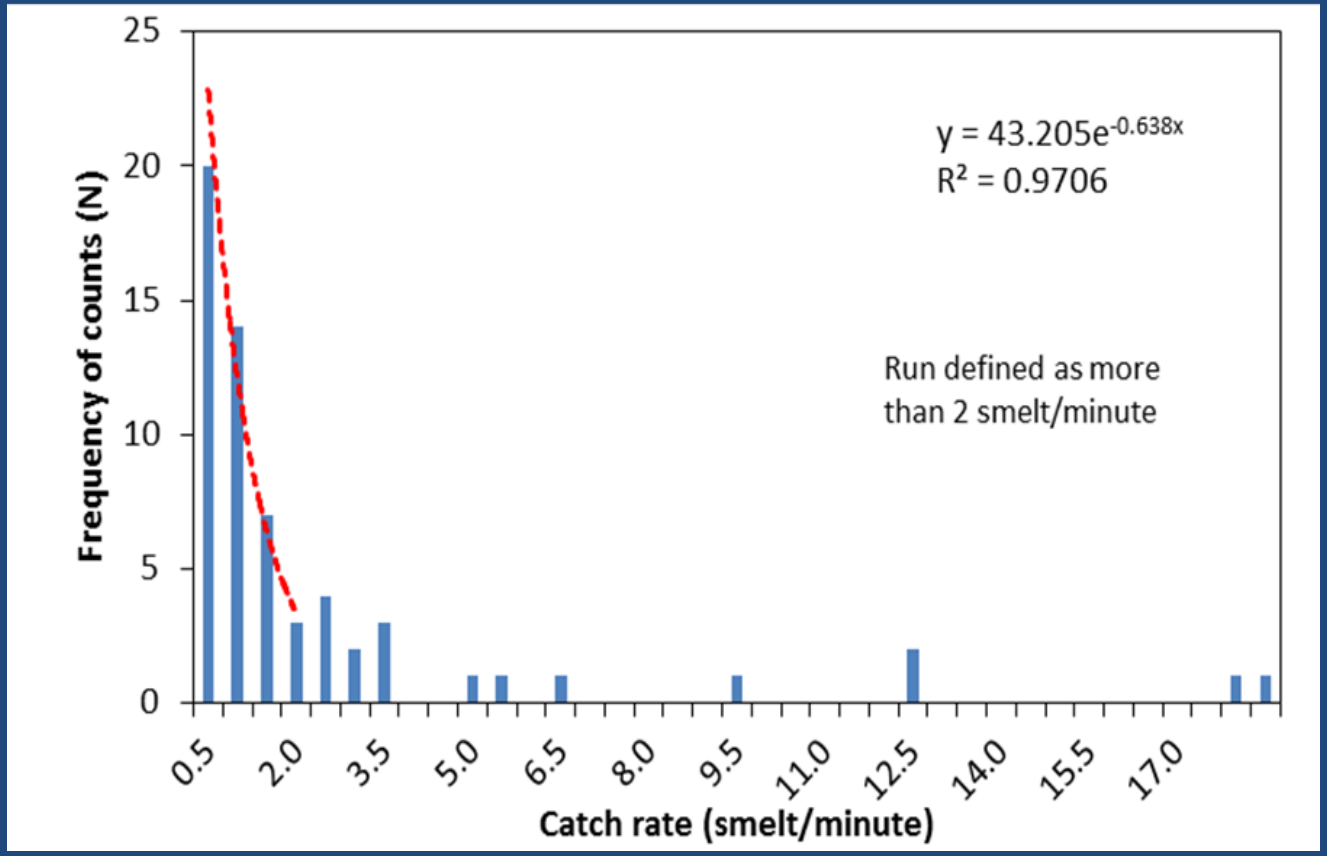
1. Smelt sampling in the Ohau Channel

- Now just 2 sampling stations (near top of Channel)
- Sampling every 2-3 weeks (Sep 12 to Jun 13) plus two in Oct 2013
- Traps lifted every few hours (over daylight hours)
- Water temperature, flow, water velocity, shag numbers, water clarity recorded

Obtained daily observations of smelt, gulls and anglers from George Proud to complement quantitative data

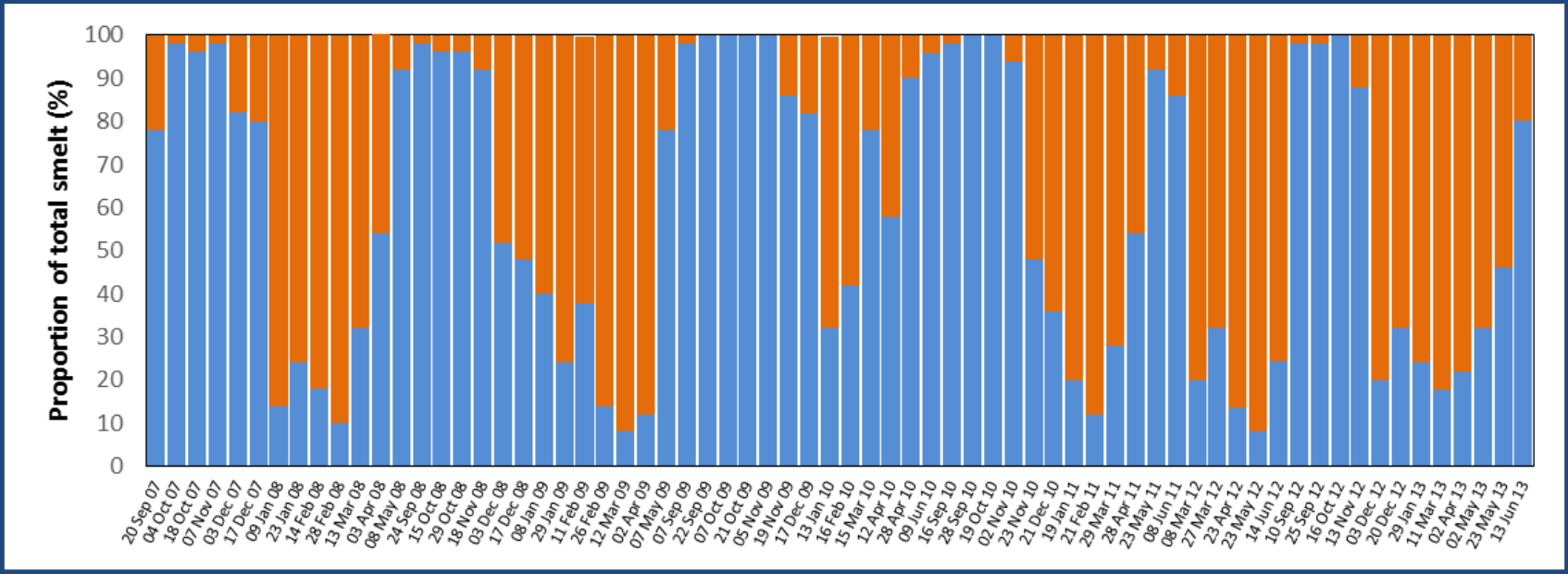
Smelt run now numerically defined

(based on observations and catch rates)

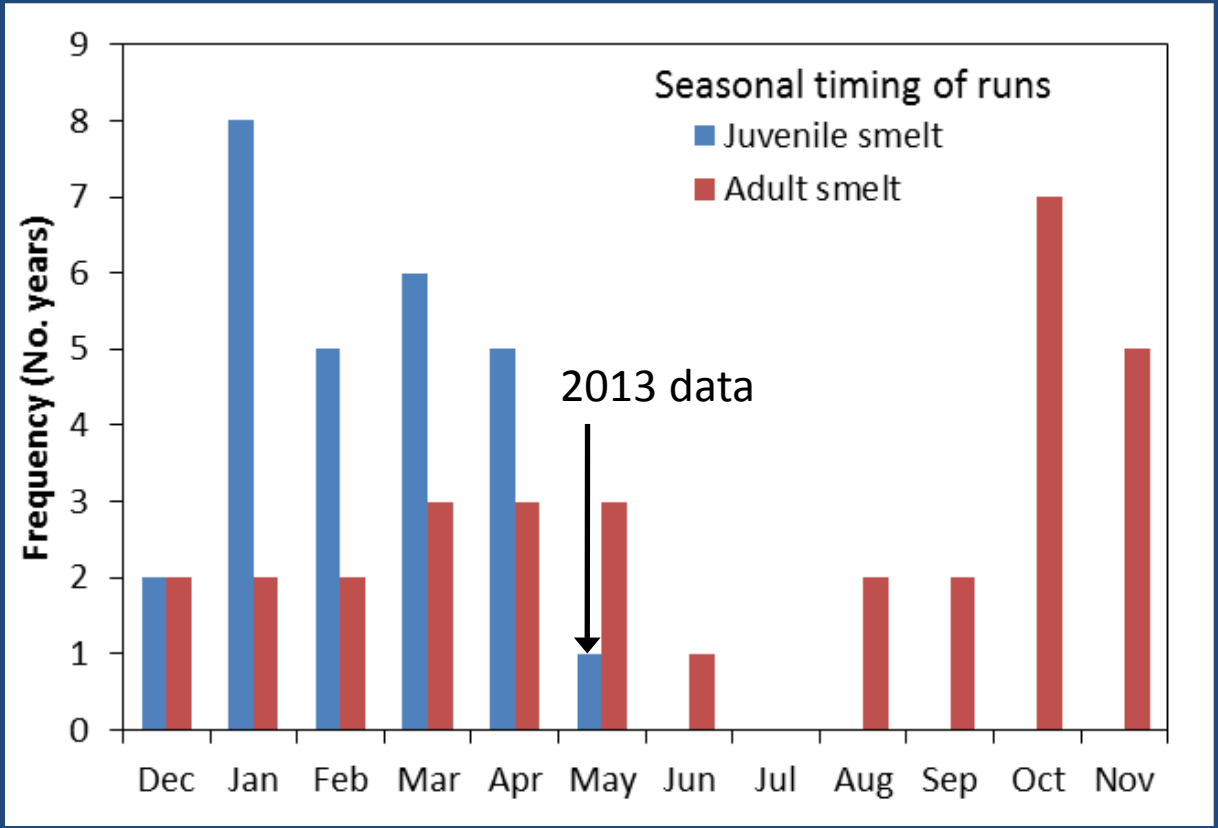


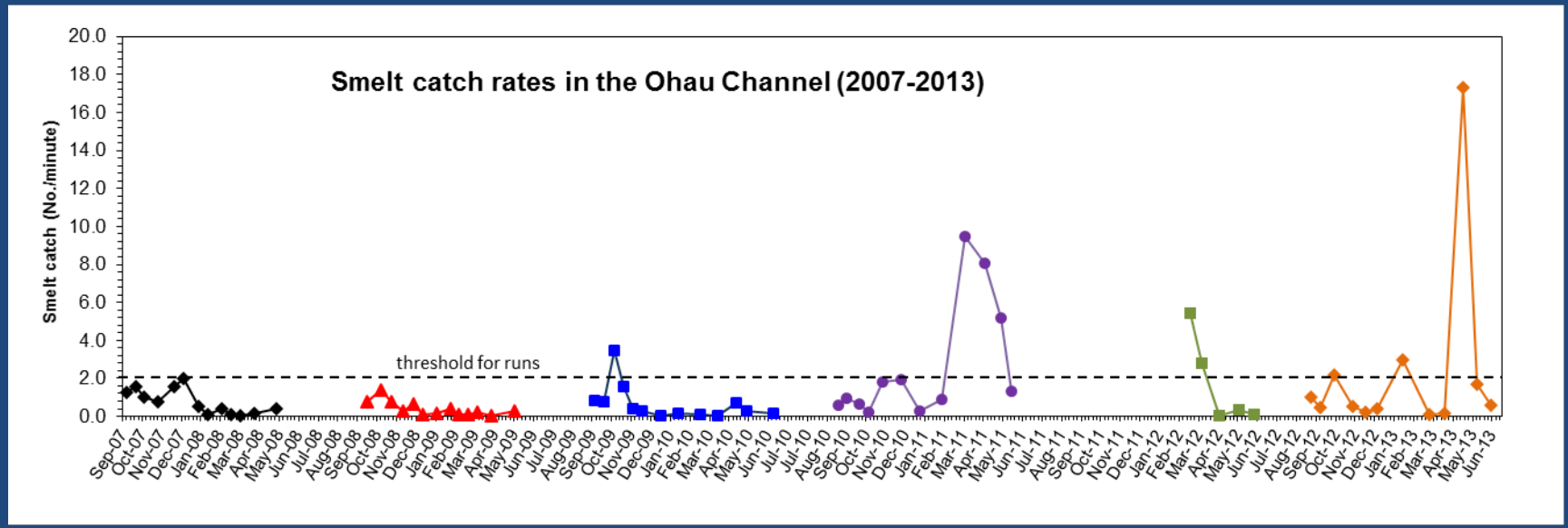
Smelt run = >2 fish/minute (= 3 shoals of 40 fish/hour)

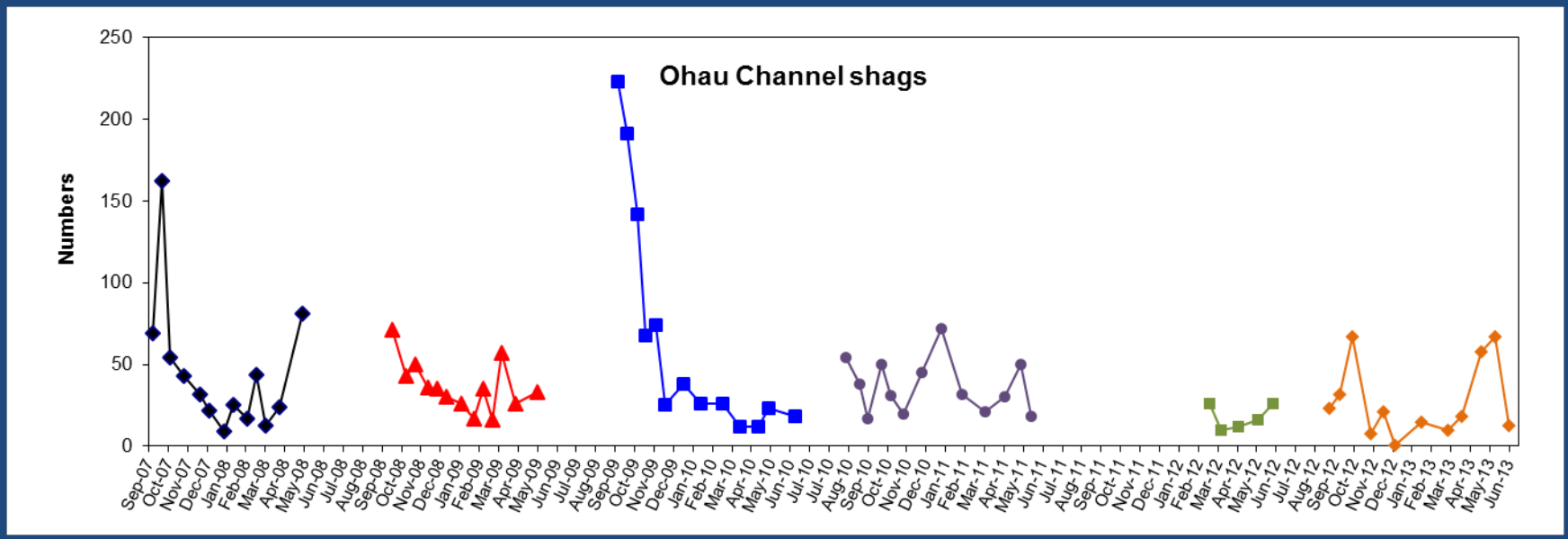
Runs contain both adult (blue) and juvenile (red) smelt, but juveniles predominate in summer months and adults in spring.

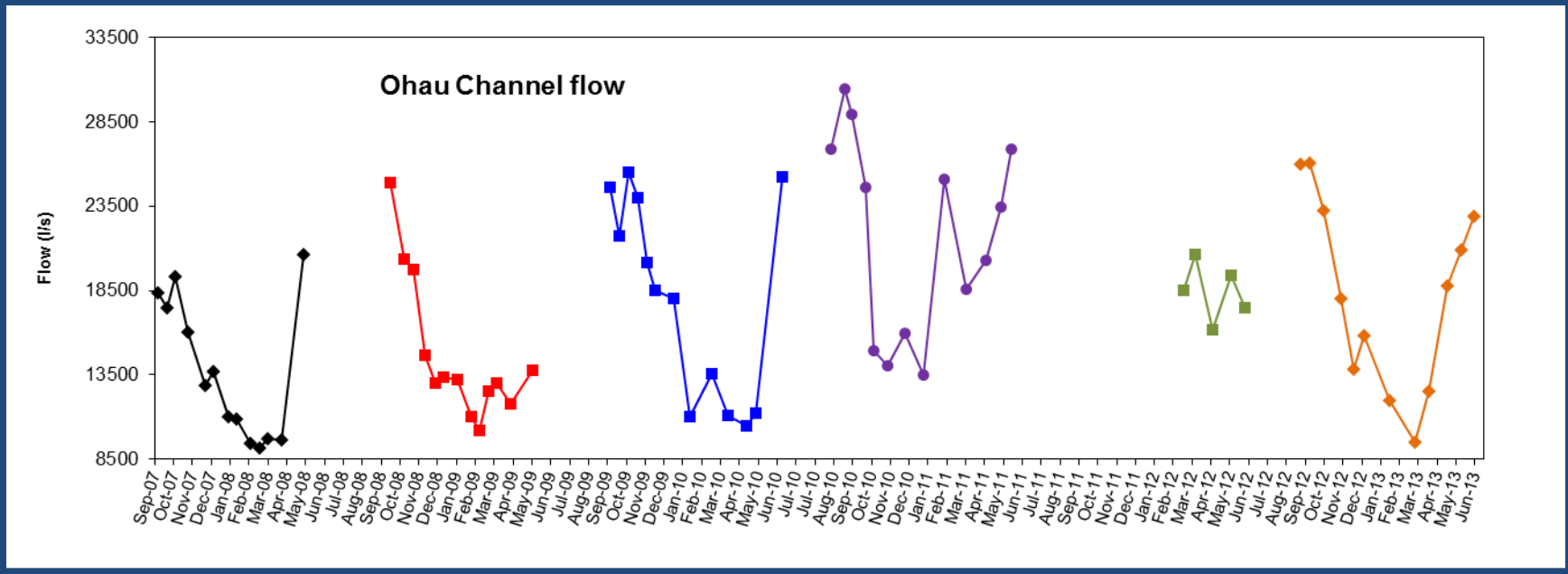


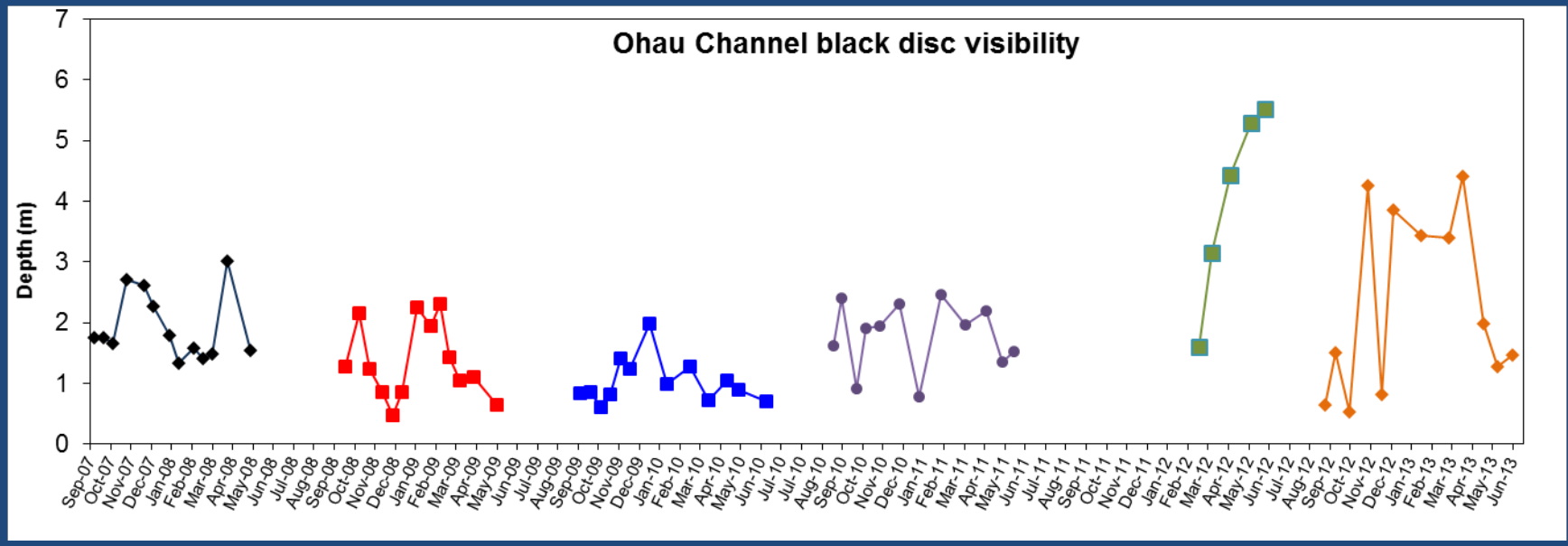
Juvenile smelt runs restricted to summer months (Dec to May)
Adult smelt runs occurred in all months but with main peak in spring (Oct) and a smaller one in autumn (Mar-May)




Smelt catch rates in the Ohau Channel (2007-2013)
Smelt catch (No./minute)
threshold for runs


Ohau Channel shags
Numbers

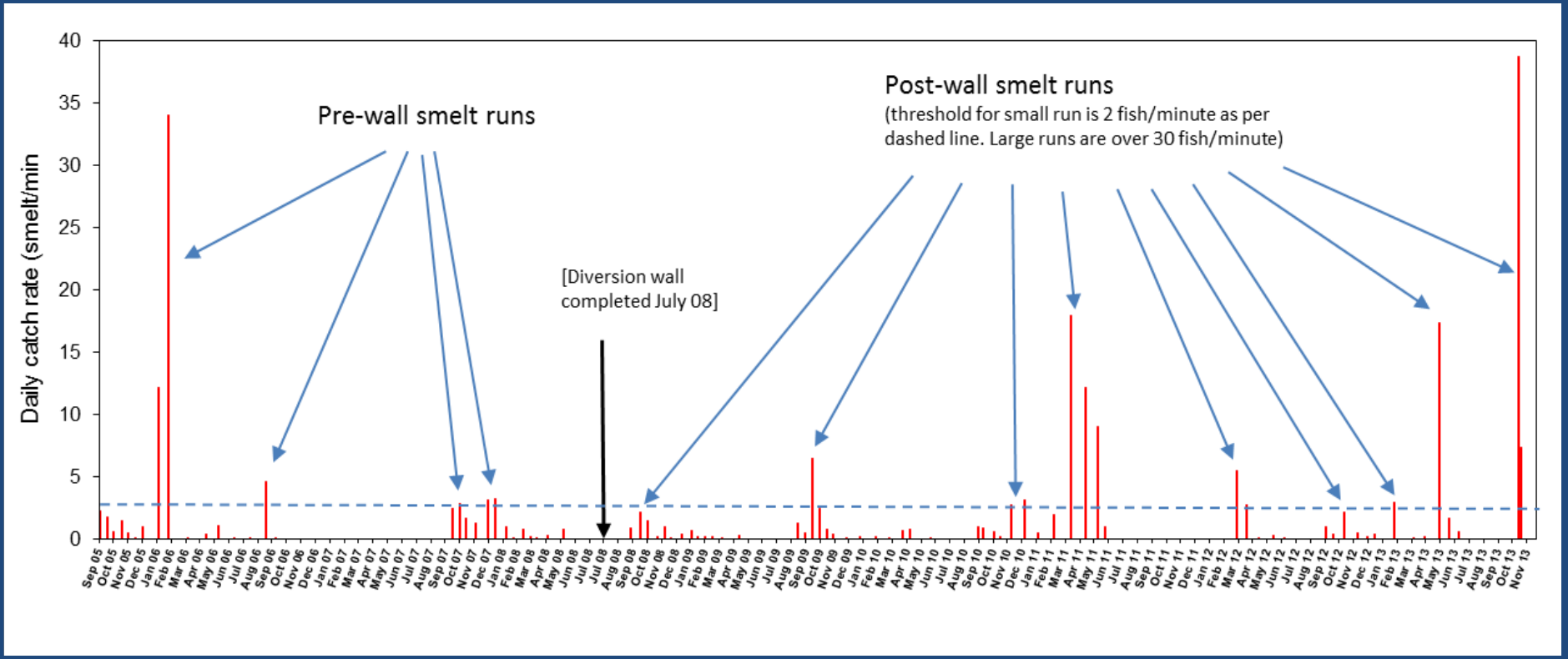

Ohau Channel flow
Flow (l/s)
33500
28500
23500
18500
13500
8500
Sep-07 Oct-07 Nov-07 Dec-07 Jan-08 Feb-08 Mar-08 Apr-08 May-08 Jun-08 Jul-08 Aug-08 Sep-08 Oct-08 Nov-08 Dec-08 Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09 Jan-10 Feb-10 Mar-10 Apr-10 May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11 Nov-11 Dec-11 Jan-12 Feb-12 Mar-12 Apr-12 May-12 Jun-12 Jul-12 Aug-12 Sep-12 Oct-12 Nov-12 Dec-12 Jan-13 Feb-13 Mar-13 Apr-13 May-13 Jun-13

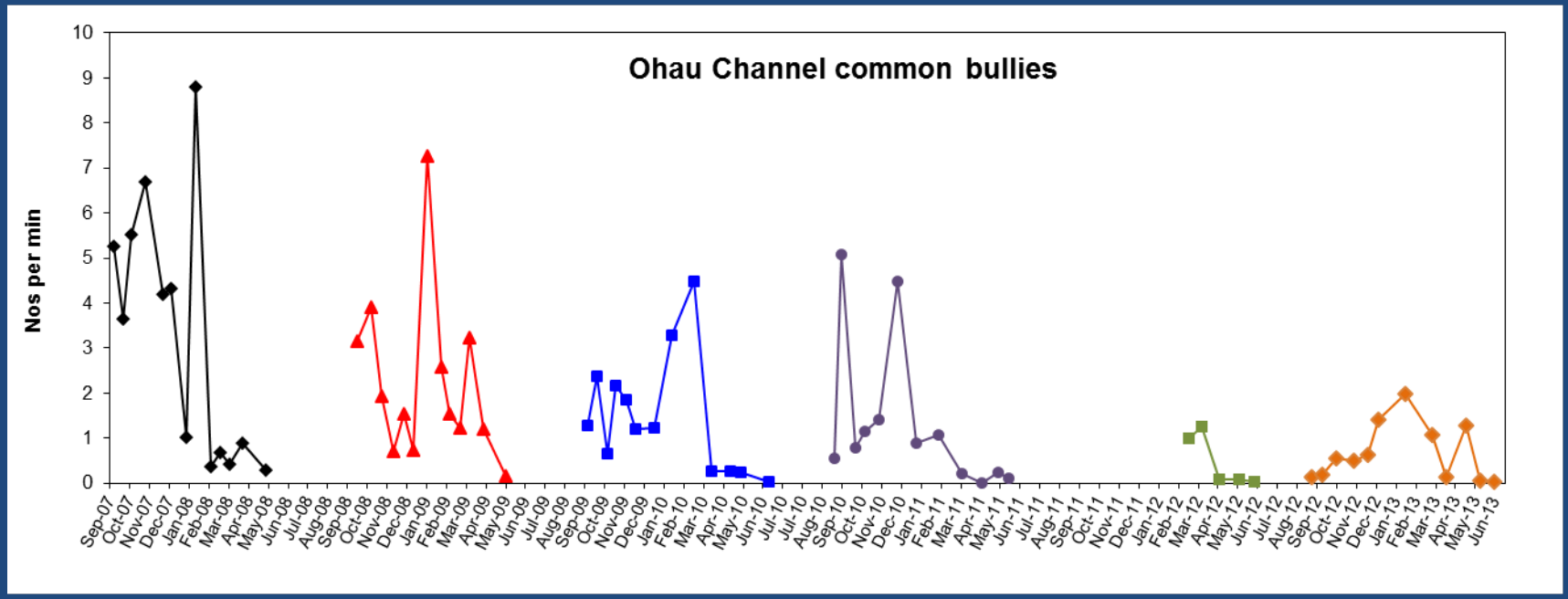

Ohau Channel black disc visibility
Depth (m)
7
6
5
4
3
2
1
0
Sep-07 Oct-07 Nov-07 Dec-07 Jan-08 Feb-08 Mar-08 Apr-08 May-08 Jun-08 Jul-08 Aug-08 Sep-08 Oct-08 Nov-08 Dec-08 Jan-09 Feb-09 Mar-09 Apr-09 May-09 Jun-09 Jul-09 Aug-09 Sep-09 Oct-09 Nov-09 Dec-09 Jan-10 Feb-10 Mar-10 Apr-10 May-10 Jun-10 Jul-10 Aug-10 Sep-10 Oct-10 Nov-10 Dec-10 Jan-11 Feb-11 Mar-11 Apr-11 May-11 Jun-11 Jul-11 Aug-11 Sep-11 Oct-11 Nov-11 Dec-11 Jan-12 Feb-12 Mar-12 Apr-12 May-12 Jun-12 Jul-12 Aug-12 Sep-12 Oct-12 Nov-12 Dec-12 Jan-13 Feb-13 Mar-13 Apr-13 May-13 Jun-13

Smelt runs up the Ohau Channel 2005-2013

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




Ohau Channel common bullies
Nos per min
0
1
2
3
4
5
6
7
8
9
10
Sep-07
Oct-07
Nov-07
Dec-07
Jan-08
Feb-08
Mar-08
Apr-08
May-08
Jun-08
Jul-08
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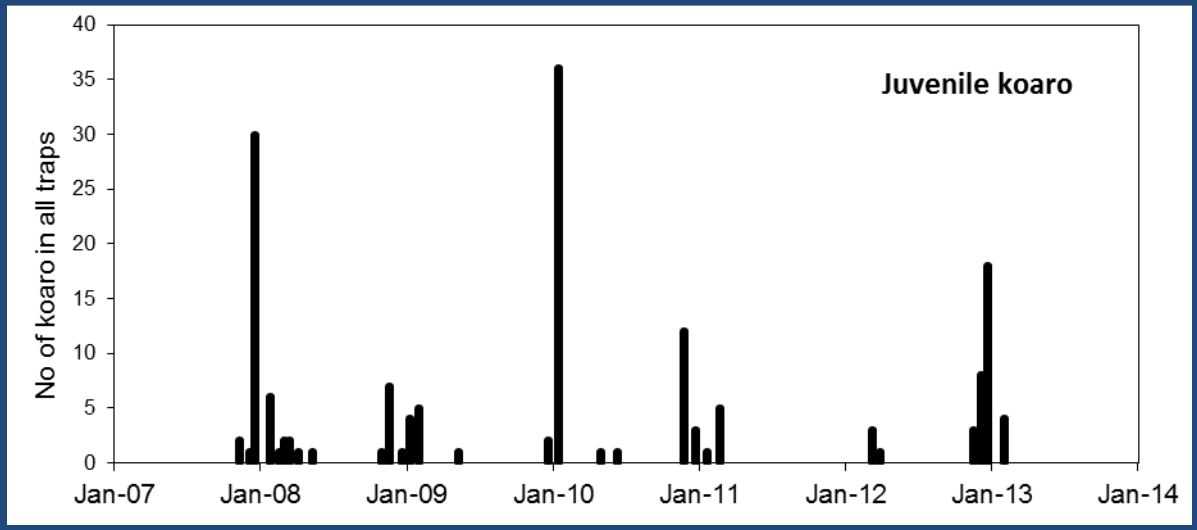
Jun-13


Juvenile koaro
No of koaro in all traps
0
5
10
15
20
25
30
35
40
Jan-07
Jan-08
Jan-09
Jan-10
Jan-11
Jan-12
Jan-13
Jan-14

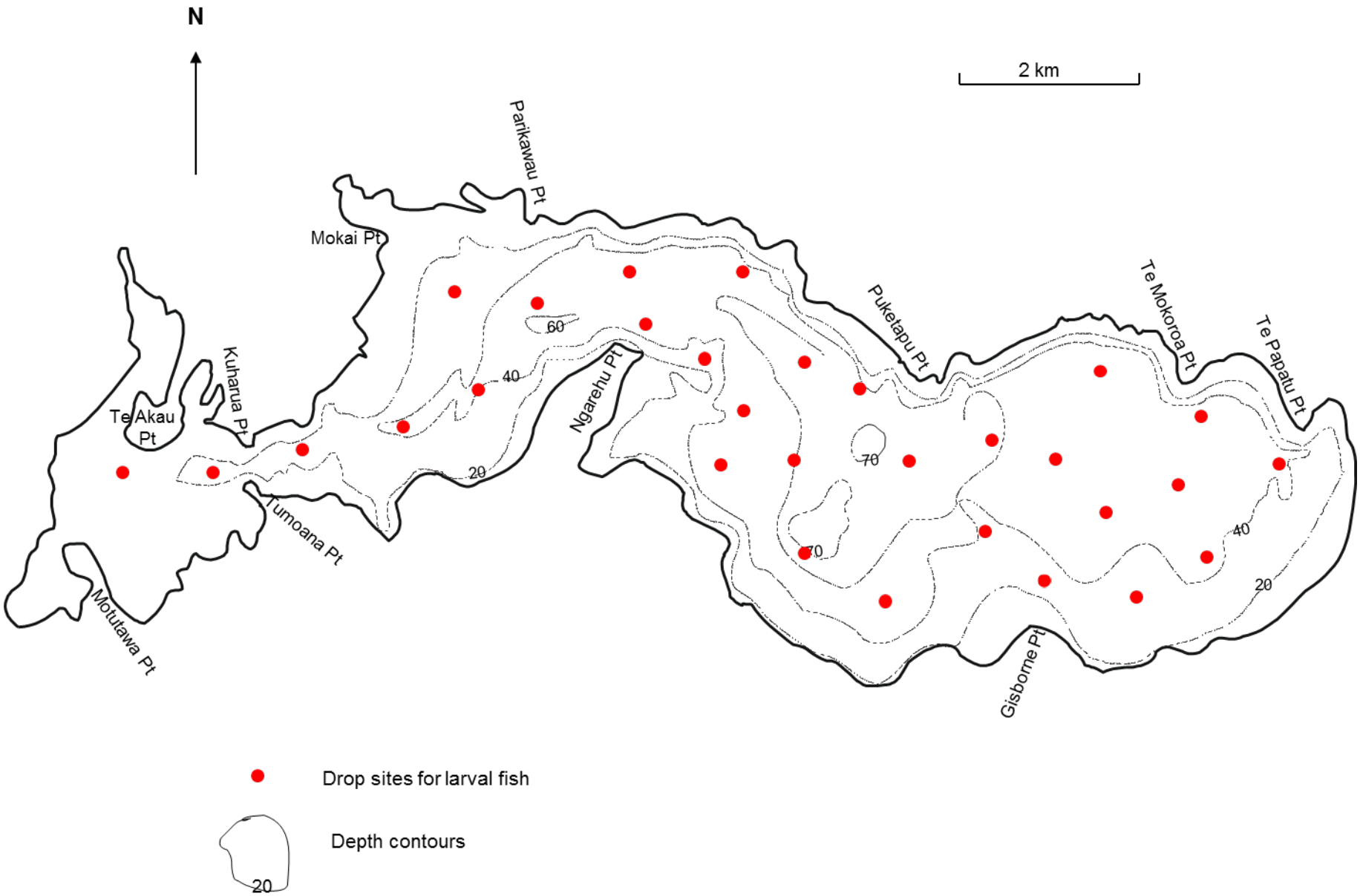
TRAPPING DATA SUMMARY

Runs of both juvenile and adult smelt have occurred in the Ohau Channel since the diversion wall was completed.

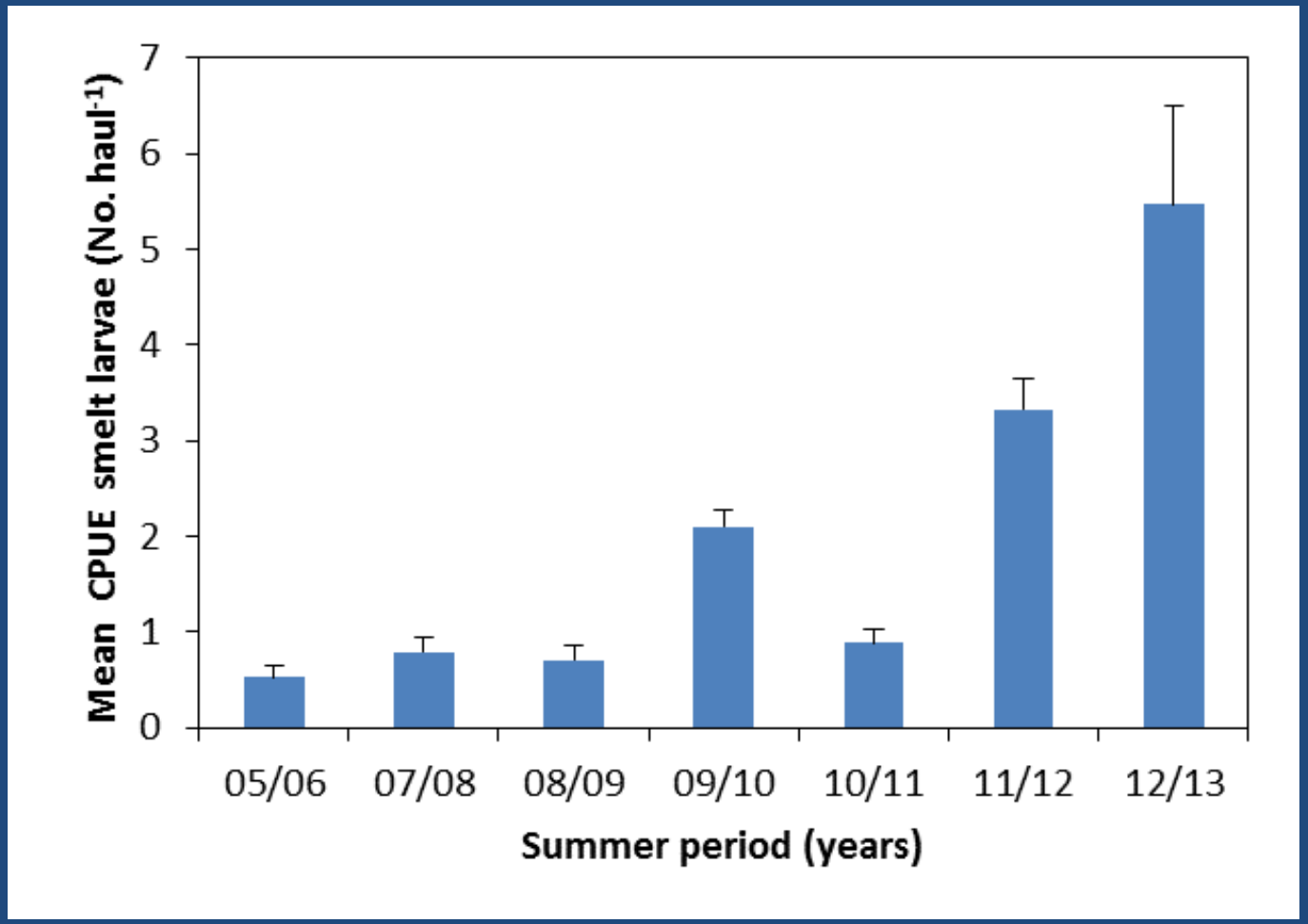
Movement of smelt up the Channel is not prevented by the wall (= no requirement for fish pass in the wall)

Annual average catch rate of common bullies has declined since 2007 (i.e., post-wall).

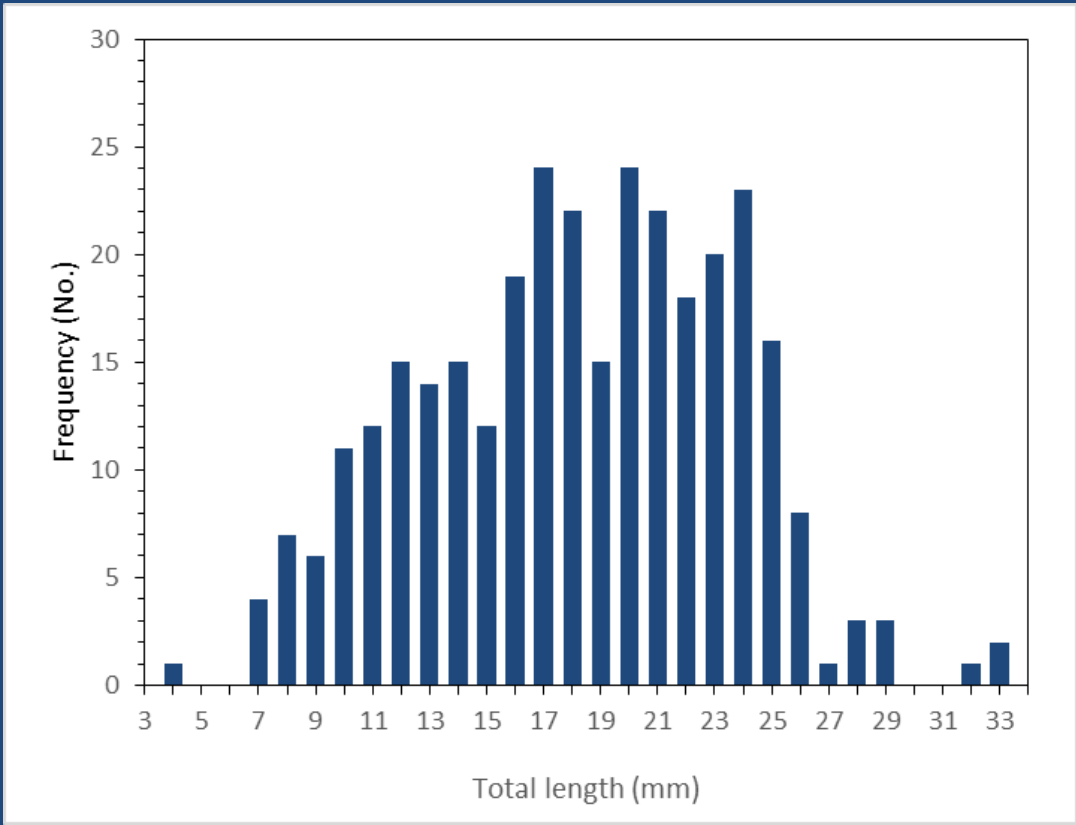
2. Approximate locations for larval smelt sampling



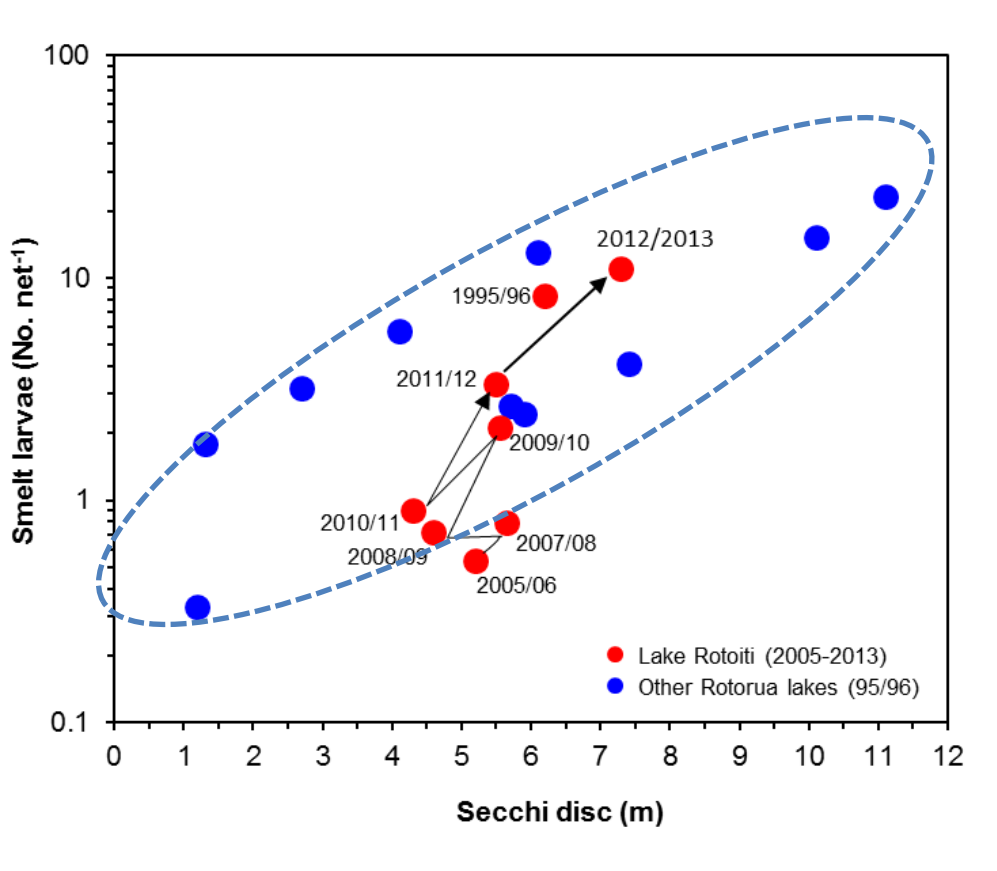
Annual changes in the mean summer density of larval smelt in L. Rotoiti



Length frequency distribution for larval smelt in December 2012

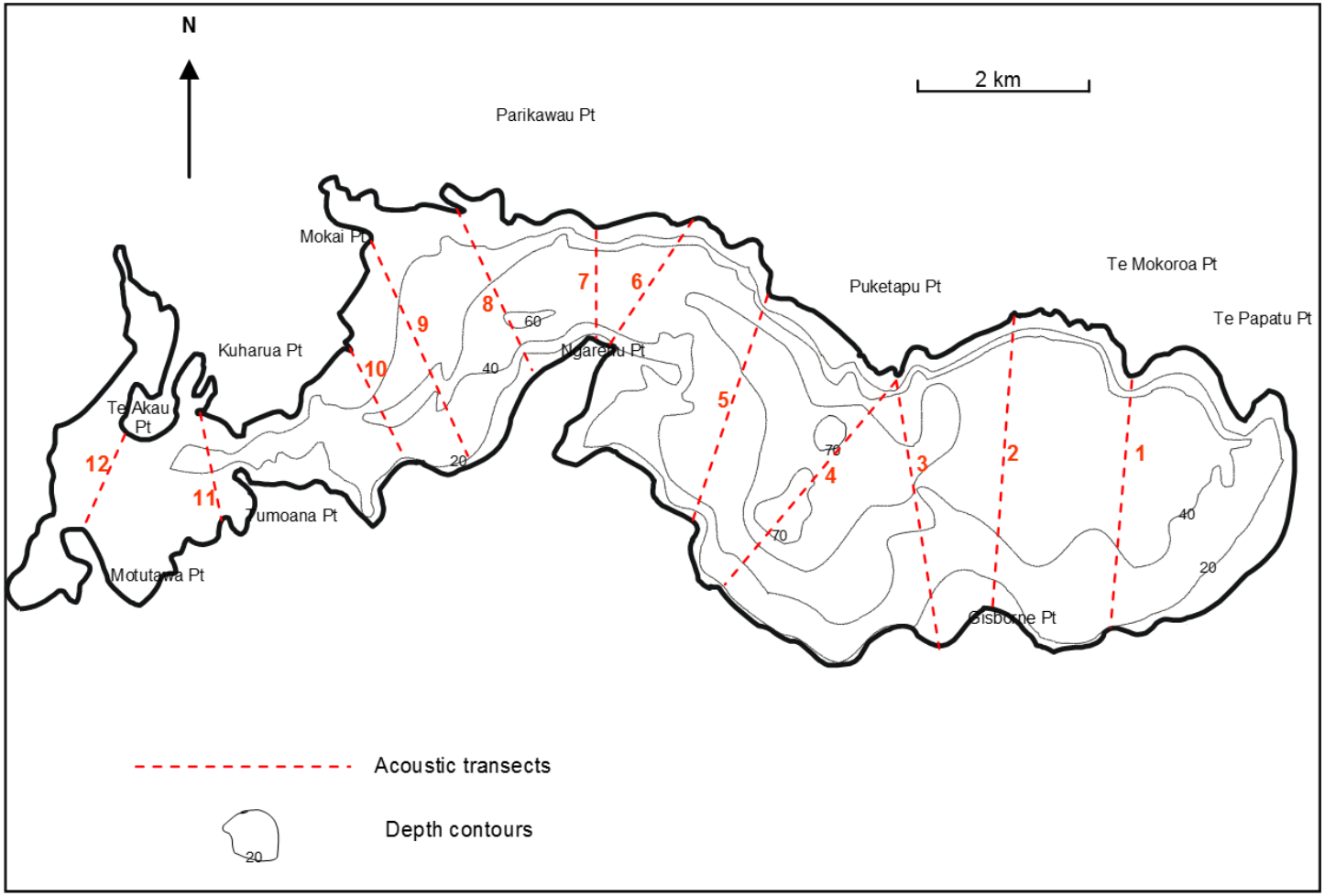


Larval smelt density in Rotoiti vs. water clarity



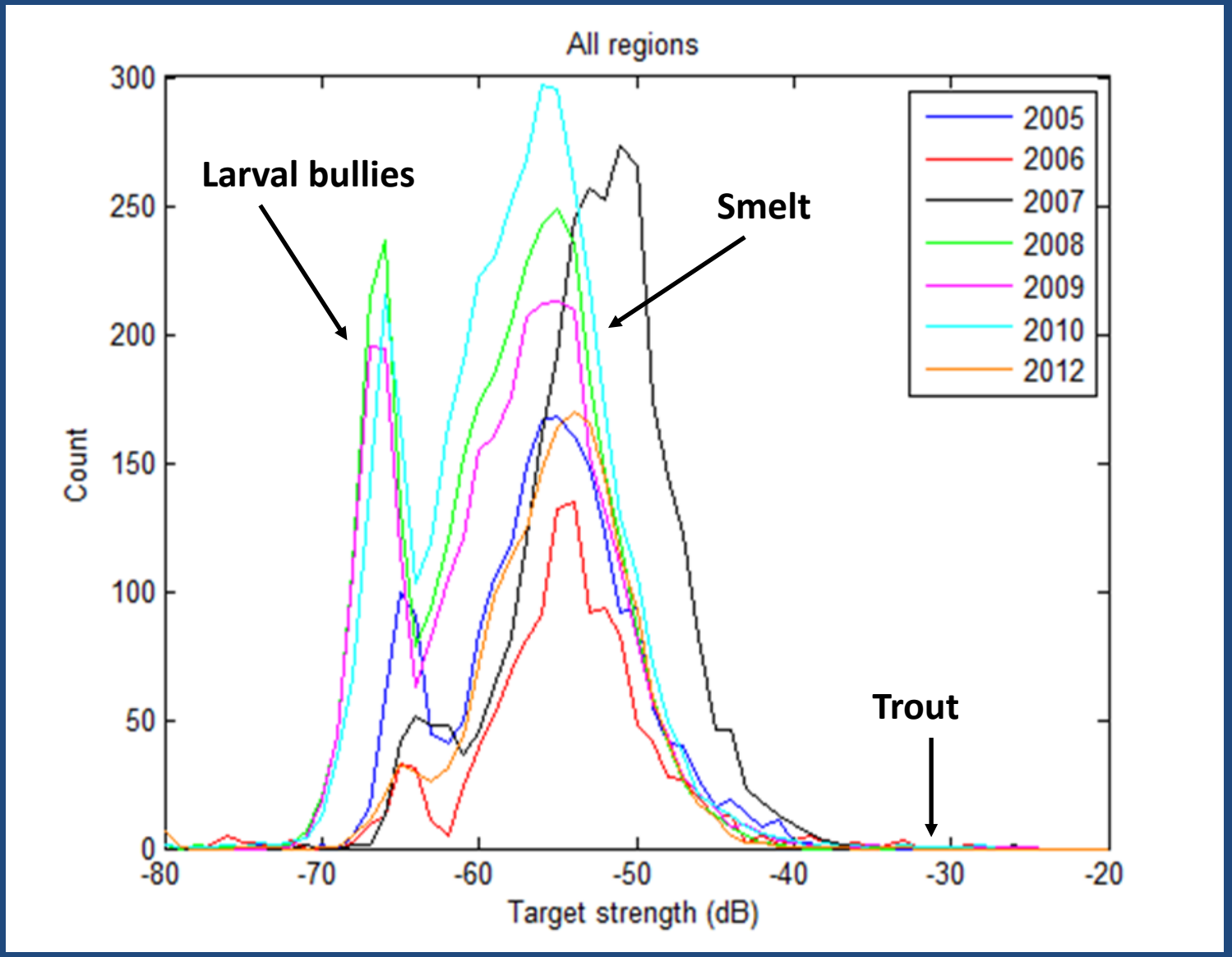
- Smelt larvae in Rotoiti expected to increase as Rotoiti's water clarity improves (this trend now becoming more apparent).
- But other changes (e.g. increases in shallow weed) could reduce smelt spawning habitat in future.

3. Adult smelt monitoring in Lake Rotoiti: assessed by acoustic surveys in September (2000-2013)

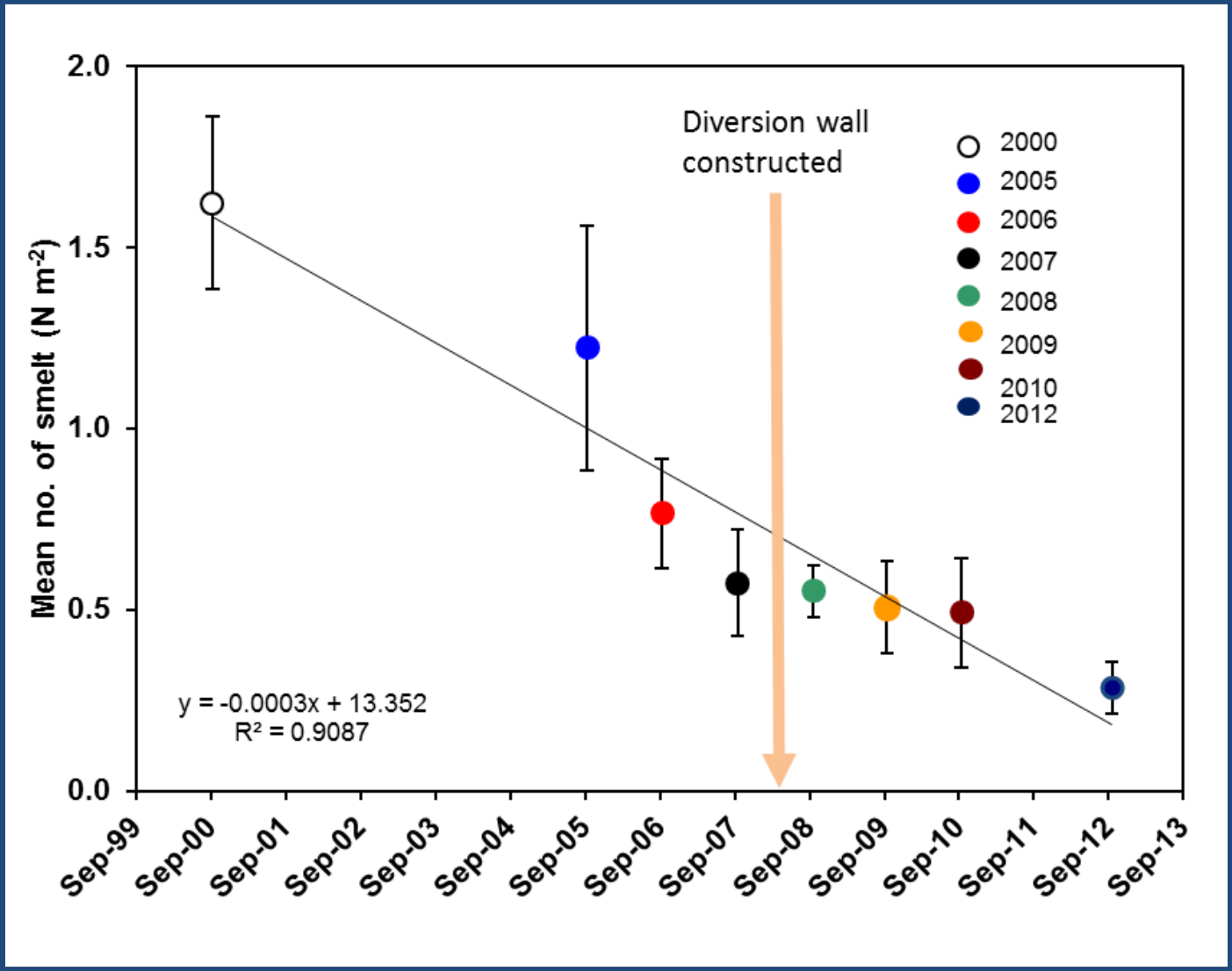


Twelve transects to cover the lake and account for any major spatial changes in areal distribution

Target-strength frequency distributions



Long-term changes in the acoustically estimated abundance of ‘adult’ smelt in Lake Rotoiti



DIVERSION WALL – SUMMARY OF EFFECTS ON NATIVE FISH

1. Both adult and juvenile smelt are migrating up the Ohau Channel to Lake Rotorua despite the presence of the diversion wall (large migrations occurred in spring 2013).

2. Catch rate of bullies in the Ohau Channel has declined since the wall went in (evidence of decline in abundance in Channel).

3. Larval smelt abundance in Rotoiti has increased over past two seasons (reflects improved water clarity in Rotoiti). Was the high recruitment in spring 2012 responsible for the large runs of adults up the Channel in October 2013?

4. Adult smelt abundance in Rotoiti in September is still decreasing. A number of factors, unrelated to the wall, could account for this.