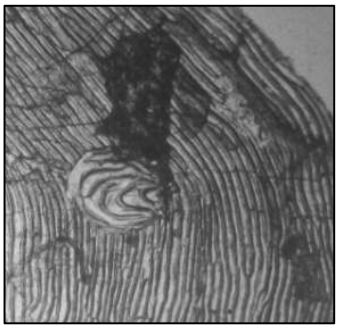
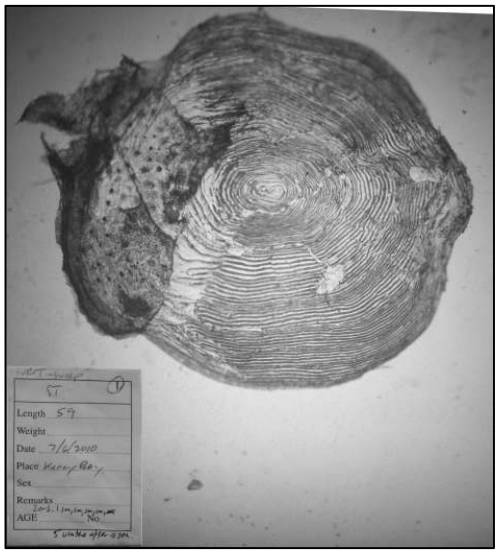
WESTER ROSS FISHERIES TRUST

Sea trout monitoring report for 2009 - 2010




Peter Cunningham, April 2011

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Summary

348 sea trout were sampled from sites in or near coastal waters in Wester Ross in 2009, 2010 and 2011. Most fish were taken from estuary or beach sites using a 50m long sweep net with a minority of fish taken from rivers, in or just above tidal waters, using rod and line or fyke net. From recorded measurements of length and weight, the condition factor of sampled fish was calculated. Some of the fish taken during July 2009 had a particularly high condition factor of over 1.4 (i.e. they were very fat) reflecting good feeding. In contrast, fish sampled in 2010 were generally smaller for their age, and condition factors generally remained lower (typically less than 1.2), at least until later in the summer. The largest sea trout sampled were taken in Loch Gairloch. In 2010 many Gairloch fish were over 30cm in length, in their second year at sea. A sea trout of 59cm, in its 6th summer at sea, was taken in June 2010.

Over-wintering sea trout were found in Loch Gairloch. In February 2010, following observations of sea trout jumping from the WRFT office, over 60 sea trout were taken from which a sample of 30 fish was examined, demonstrating the occurrence of a winter population of sea trout in the sea. In winter 2011, few fish were seen jumping; one thin fish (condition factor 0.85) was taken in February, and then another 14 were taken in the sweep net in Charleston Harbour in March 2011. Harbour Seals were recorded in Charleston Bay on several days during the week prior to the date of sampling in February 2010.

Sea trout were infected with the fish louse *Lepeophtheirus salmonis* and *Caligus* sp. (or spp.), and cysts of the trematode fluke, assumed to be *Cryptocotyle lingua*. *L. salmonis* infection levels on Loch Ewe fish in 2009 and 2010 were lower than the epizootic levels of 2007 with only a few heavily infected fish with more than 50 lice on them. There were no reports of 'early-returned' sea trout in the River Ewe in June in either 2009 or 2010. However, despite being in good condition, some of the finnock in the River Ewe in 2009 had partially eroded dorsal fins indicative of sea louse damage. *L. salmonis* infection levels of sea trout in Loch Gairloch were higher than at other sites. Many sea trout taken in Loch Gairloch had dorsal fin damage from lice infection, particularly in the summer of 2010. In March 2011, one of the Gairloch sea trout carried 69 sea lice, including 54 similar sized small pre-adults. *C. lingua* infection levels of sea trout in Loch Gairloch were also higher than at other sites, with estimated densities of up to 50 black spots (= *C. lingua* cysts?) per square cm of fish tail fin (possibly over 1000 parasite spots per fish). These levels of infection may be high enough to compromise the health of the fish and increase their vulnerability to predation. In turn, the very high levels of encysted *C. lingua* on sea trout and other fish (e.g. juvenile Pollack and Grey Gurnard) may represent a health threat to any final bird or mammal host (e.g. seal or otter) that subsequently eats them. Literature associates high *C. lingua* densities with high seagull densities. In Loch Gairloch, high numbers of gulls (300+) have been recorded by the outflow of the Inverkerry fish farm pipe.

Scale samples were taken from which estimates of fish ages and growth rates were obtained. Some of the scales have been photographed for presentation alongside pictures of respective fish in an on-line sea trout scale library for future reference. Scales from sea trout in Loch Gairloch had marks attributed to infection by *Cryptocotyle lingua.* An on-line Sea trout Scale Catalogue can be found on the WRFT website.

In conclusion, samples of sea trout taken in 2009 and 2010 highlight factors in addition to sea lice infection that can affect the wellbeing of sea trout in the near-shore environment around Wester Ross. In particular, the prolific growth of sea trout in summer 2009, apparently in response to a glut of small 0+ sandeels, demonstrates the importance of food availability in the early summer, in addition to sea louse infection pressure, to the health and productivity of sea trout populations within the area.

Cover photos: *(top left) Cryptocotyle lingua spot on sea trout scale; (top right) Sea trout of 590mm taken in the WRFT sweep net on 7th June 2010 in Kerry Bay (Loch Gairloch); (mid left) sweep netting team on 15 July 2009 at Boor Bay; (mid right) scale of the 590mm sea trout shown above (bottom left); Roger McLachlan, Garry Bulmer and Ben Rushbrooke in Charleston Bay (Loch Gairloch) on 1st February 2010. (bottom right) sea trout and sprats taken in the sweep net at Boor Bay on 13th September 2010.*

Contents

1. Introduction

1.1 Objectives

This report presents results of the WRFT sea trout sampling programme for the years 2009 and 2010, including the Scottish Government funded sweep netting programme to monitor sea lice on sea trout; and provides additional information from supplementary sampling of sea trout taken in other areas using rod and line.

The primary objective of the sea trout sampling programme was to obtain sea trout to assess levels of infection by the sea louse, *Lepeophtheirus salmonis*. In addition, from recorded measurements of length and weight, and from reading of scales taken from sea trout, much other information has been obtained.

This report covers the following:

- Details of the numbers of sea trout caught at respective sampling sites, including their lengths and weights
- Information on the age and respective growth rates of sampled sea trout
- Sea lice monitoring data and graphs for respective sites in respective years
- Information about infection by ?*Cryptocotyle lingua*
- Records of other species seen or captured during sampling, including some potential sea trout prey species
- General discussion of the health of sea trout populations in respective sampling areas and in respective years

The report focuses primarily on sea trout samples from Loch Ewe and Loch Gairloch, and provides data from fish taken from the mouth of the River Carron.

1.2 Background information

Since 1997 the WRFT has monitored sea trout at various sites within Wester Ross. Until 2008, samples were taken using a gill net set at the mouth of the River Ewe in June each year. From 2008, sea trout have been sampled using a sweep net in Loch Ewe and the gill netting programme has been discontinued. In addition, rod and line has been used to provide supplementary samples of sea trout from the River Ewe. In 2008 the WRFT initiated a sweep netting programme to also sample sea trout from the mouth of the River Carron and from Loch Gairloch.

Data from 2007 and 2008 can be found in the WRFT Sea lice Monitoring Report for 2007-2008 which can be found on-line at: http://www.wrft.org.uk/files/WRFT%20Sea%20lice%20monitoring%20report%202007-2008%20for%20web.pdf . The 2007-2008 report also considers relationships between lice levels on sea trout within the WRFT area and the location and year of production of nearby salmon farms within the area. Rather than revisiting questions relating to this relationship which have since been addressed by Marine Science Scotland using larger data sets incorporating sea lice data from other West Coast Fisheries Trusts in Scotland, the current report focuses on other questions relating to the survival and growth of sea trout within the marine environment around Wester Ross.

2. Methods

2.1 Sampling

Sweep netting has become the standard method for obtaining samples of sea trout in the sea. The method used for catching fish and recoding sea lice data follows the protocol adopted by the Scottish Fisheries Co-ordination Centre. Successful sweep netting is dependent on there being a suitable site where sea trout congregate over a shallow-shelving substrate without too many snags to catch the leadline of the net as it is pulled in. Some sites where sea trout have been successfully caught are in the estuary pools of rivers where fish gather as the tide goes out (e.g. River Carron Sea Pool). In contrast several beaches further from river mouths have produced reliable if usually somewhat smaller samples of sea trout, along with sandeels, sprats, wrasse and juvenile gadids. Boor Bay, Inverasdale shore and Kerry Bay are examples of such sites. Supplementary samples of sea trout were taken using rod and line from lower pools of rivers during the summer and autumn.

Following capture, fish were anaesthetised, measured, weighed and lice were counted by holding the immobilised fish underwater in a light coloured basin. Details of parasite infection (by *Lepeophthierus salmonis, Caligus* spp*., ?Cryptocotyl lingua*) were recorded, and many fish were photographed.

2.2 Condition factor

This is a measure of the relationship between length and weight of respective fish, according to the formula:

$$\textit{Condition factor} = (\textit{weight [in grams]} \times 100) / (\textit{length [in cm]}^3)$$

At the end of the winter, sea trout are usually thin and typically have a condition factor of less than 0.90. After entering the sea they may grow quickly if there is abundant food; unusually plump sea trout with a condition factor of over 1.40 were recorded in July 2009.

2.3 Scale reading

Sea trout scales were read to determine the age of respective fish, and from back-calculation, estimates of fish length at earlier ages. Many scales samples contained only 'replacement' scales (indicative of earlier scale loss and regrowth) from which it was not possible to determine age. However, some useful data has been collected and an on-line sea trout scale catalogue has been developed.

Sea trout scales were read by projecting their image onto a screen using an EyeCom3000 microfiche reader. Some training and peer review was provided by Dr Andy Walker at a sea trout scale reading workshop on February 17th 2011, which took place in the WRFT office. The on-line Sea Trout Scale Catalogue provides photographs of projected images and of fish can be reviewed by other biologists to agree interpretation; follow links to downloads from here. Otherwise, the method of reading scales follows that of Nall, 1930, and Walker, 1980.

Estimates of fish length at different ages were extrapolated from measurements of scales, using methods described by Nall, 1930, where the scale is assumed to grow roughly in proportion to the length of the fish. An Microsoft Excel spreadsheet was used to convert measurements of distances from scale origins to winter checks and other features of projected scale images, to obtain estimates of fish lengths and compare growth rates between fish and between sites and years. Errors relating to this method are considered later in this report.

3. Results and discussion

Appendix 1 provides details of fish sampled in 2009 and 2010; Table 1 provides a summary of this data. Table 4 provides some age and growth information for a sub-sample of these fish from which readable scales were collected.

3.1. Loch Ewe

Levels of sea louse (*Lepeophtheirus salmonis*) infection on sea trout were generally much lower than during 2007 in both 2009 and 2010. No very heavily infected sea trout (>100 lice / fish) were recorded in Loch Ewe or in the River Ewe in either year.

2009

In total 35 fish were sampled in 2009. This included a catch of 15 sea trout taken in the sweep net at Boor Bay on 15th July 2009. These fish were in excellent condition and 13 of them had a condition factor[1] of 1.20 or over (in other words, they were fat). The largest of these was a fish of 380mm and condition factor of 1.46, which remains the 'best' conditioned sea trout seen by the WRFT biologist to date. There was an average of 17 *Lepeophtheirus salmonis* lice per fish (range 0 - 40 lice per fish) and 1.1 *Caligus* sp. per fish.

Thirteen finnock were taken by rod and line from the River Ewe on 9th – 10th July 2009 of between 230mm and 270mm in length. With condition factors all above 1.30, these fish had also grown well at sea. They carried an average of 12 *L. salmonis* per fish (range 0-25 lice per fish) and seven (58%) of them had slight dorsal fin damage attributed to sea lice infection.

Finnock taken from the River Ewe on 10 July 2009 (photo by Steve Kett).

[1] Condition factor: (weight in grams x100) / (length in mm/10)^3

Table 1 Summary sea lice data for samples of sea trout caught in 2009 and 2010

Date	Location	Method	Sample size (no. of fish)	Number of infected fish	Abundance	Prevalence	Intensity	Average chalimus	Average mobile
May-09	Carron	sweep	7	0	0	0	0	0	0
May-09	Boor Bay	sweep	2	1	10.5	50	21	4	17
Jun-09	Gairloch	sweep	16	14	15.13	87.5	17.29	7.71	9.57
Jun-09	Boor Bay	sweep	3	2	5	66.67	7.5	4	3.5
Jul-09	Ewe	rod	13	12	11.85	92.31	12.8	4.4	8.42
Jul-09	Boor Bay	sweep	15	15	17	100	17	9.47	7.53
Jul-09	Kerry Bay	sweep	6	6	58.67	100	58.67	27.5	31.17
Aug-09	Bay Bay	sweep	3	3	17.33	100	17.33	11.33	6
Feb-10	Charleston	sweep	36	31	5.31	86.11	6.16	2.74	3.42
May-10	Charleston	sweep	30	18	10.97	60	18.28	15.67	3.06
Jun-10	Boor Bay	sweep	19	9	1.58	47.37	3.33	0.67	2.67
Jun-10	Carron	sweep	33	21	7.64	63.64	12	5.76	6.24
Jul-10	Gruinard	rod	2	2	36.5	100	36.5	17.5	19
Jul-10	Kinlochhourn	rod	4	4	14	100	14	8.25	5.75
Jul-10	Gairloch	sweep	6	4	17.5	66.67	26.25	8.75	17.5
Aug-10	Inverasdale	sweep	2	2	35.5	100	35.5	12.5	23
Aug-10	Carron	sweep	60	10	1.27	16.67	7.6	4.5	3.4
Aug-10	Boor Bay	sweep	5	5	16	100	16	10.4	5.6
Aug-10	Charleston	sweep	10	10	15.6	100	15.6	4.5	11.1
Sep-10	Boor Bay	sweep	2	2	6	100	6	1	5
Sep&Oct-10	Gairloch	sweep	9	8	8.67	88.89	9.75	1.38	8.38
Feb&Mar-11	Gairloch	sweep	15	15	16.27	100	16.27	4.07	12.2

2010

In total 34 sea trout were sampled either by sweep net in Loch Ewe or rod and line from the River Ewe. The largest sample was of 15 fish taken in the sweep net at Boor Bay on 15th June. These fish were small (average length 167mm), thin (average condition factor of 1.00), but mostly lice free with only 5 fish carrying lice (maximum of 17 *Lepeophthierus salmonis* per fish).

Only 6 fish were caught in July: 4 small post-smolts in a sweep net sample at Boor Bay on 15th July, and two larger fish (including one of 430mm) by rod and line from the River Ewe on 16th July. All these fish were thin for the time of year, with condition factors of less than 1.20. There were less than 10 lice on any these fish.

In August and September, some larger fish were caught. On 3rd August the sweep net team sampled the shore at Inverasdale, catching a plump sea trout of 351mm, condition factor 1.35. However another sea trout of 311mm had a condition factor of only 1.10. Large sandeels (estimated length 10cm +) were seen coming out of the net as it was pulled in; were these too big for smaller trout to feed on? The larger fish carried 67 sea lice (mostly pre-adult and adult lice), had a partially eroded dorsal fin, and was the lousiest sea trout seen in Loch Ewe in 2010.

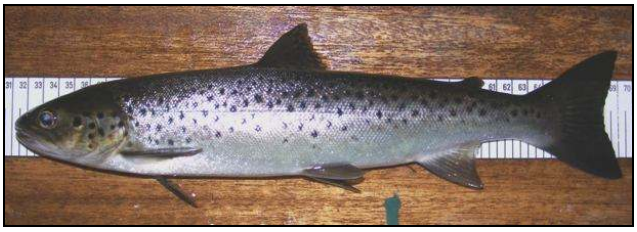
(left) The sweep net sampling team by Inverasdale on 3rd August 2010, and (below) the 351mm sea trout taken.

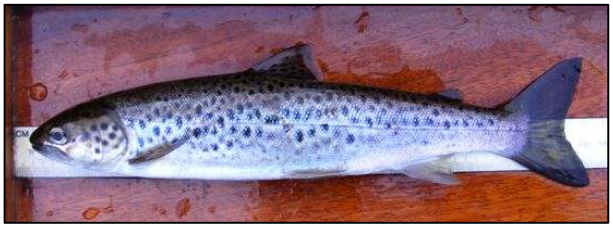
Five small (165 - 193mm) post smolt sea trout were taken in the Boor Bay sweep net on 12 August; with condition factors of up to 1.35 indicating reasonable growth; and a further two fish of 197mm and 265mm on 13th September, along with many sprats which the sea trout may have been feeding on.

Sea trout and sprats taken at Boor Bay in the sweep net on 13 September 2010.

In summary, 2010 was a difficult year for learning about sea trout in Loch Ewe. Some sea trout smolts may have been delayed in entering Loch Ewe by a cold spring and low water in late May, where feeding was initially less prolific than in 2009 with fewer 0+ sandeels recorded. Many of the sea trout caught were small, even compared to the smolts taken in the River Ewe rotary screw trap in May and early June. In July few sea trout were caught in either the sweep net or by rod and line. From the beginning of July, river levels rose following heavy rainfall, and freshwater discharge into Loch Ewe remained high for much of the remainder of the summer. This may have encouraged sea trout to disperse away from the river estuary. Although recorded sea lice infection levels were relatively low in June and July compared to some previous years, there was little evidence of good feeding or growth, at least until the end of the summer.

Two sea trout taken in the Flats Pool of the River Ewe on 12 October 2010.





A sweep net session along the Inverasdale shore on 16 March 2011 failed to produce any sea trout; to date we have no records of sea trout over-wintering in the sea in Loch Ewe.

3.2 Loch Gairloch

The combined samples of sea trout caught in Loch Gairloch included a higher proportion of older fish than in Loch Ewe. Figure 1 shows sizes of fish of inferred respective smolt-year classes taken during the two year period.

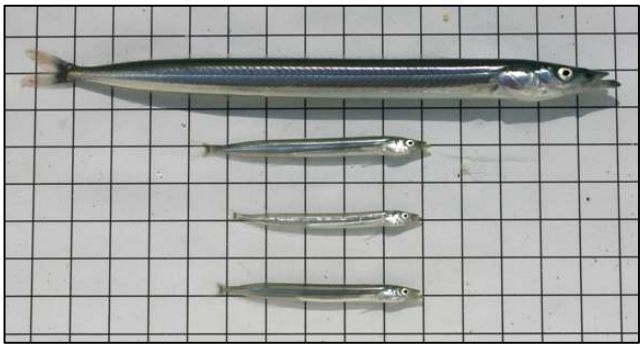
2009

24 sea trout were caught between June and August 2009, 21 of which were taken in Kerry Bay and 3 in Charleston Bay. Fish ranged in size from 147mm to 395mm. 15 of the fish were less than 260mm in length. Fish were generally in good condition: 15 of the 21 fish which were weighed had a condition factor of 1.20 or more (maximum 1.44), demonstrating good feeding.

However, all but two of the fish had *Lepeophtheirus salmonis* sea louse infection; 13 (86%) fish had over 15 lice (maximum 79 lice). 15 of the fish that were less than 260mm in length, and of this subset of smaller sea trout (including post-smolts) 13 fish (86%) were infected with sea lice, with an average of 23.2 lice per fish.

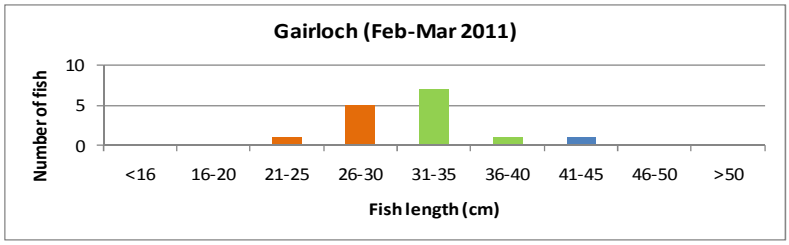
There were approximately equal proportions of attached (chalimus) and mobile (pre-adult and adult) stage lice per fish throughout the sampling.

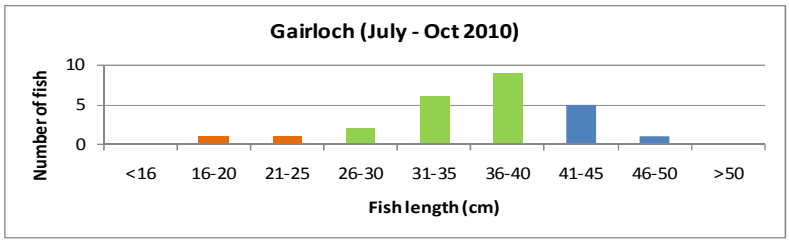
Fishing for sandeels off Strath Beach, Loch Gairloch, July 2009. Picture by Steve Kett.

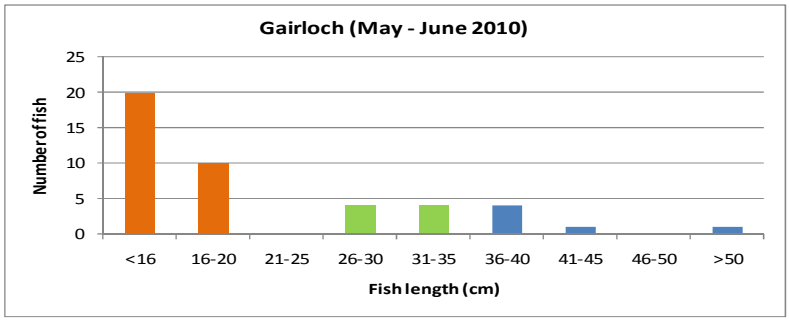


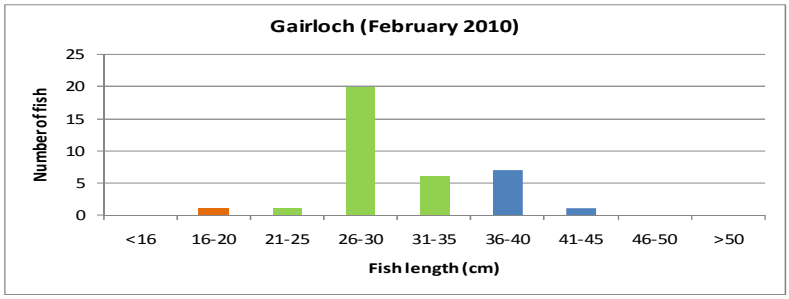
Sea trout of 370mm, condition factor 1.44 taken on 29th June 2009 at Kerry Bay. This fish had 36 sea lice and a partially eroded, lice damaged dorsal fin.

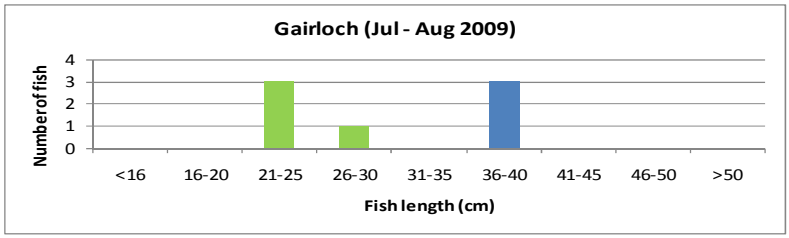
Figure 1 Combined catches of sea trout within Loch Gairloch at sweep netting sites in Kerry Bay and Charleston Bay, indicating numbers and sizes of fish from 2010 (orange), 2009 (green) and 2008 and earlier (blue) smolt-year classes, based on scale reading.

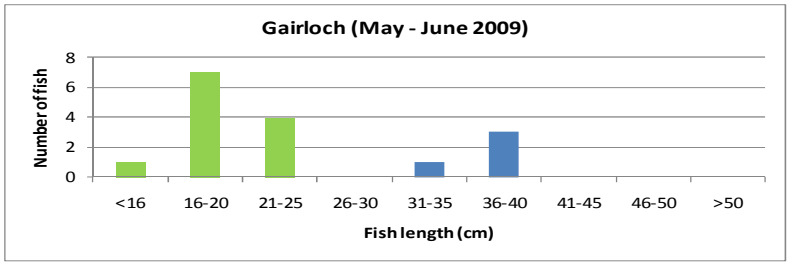












2010

In January 2010, sea trout were seen jumping frequently in Charleston Bay in front of the WRFT office. On 1st February, following removal of some debris from the estuary which could have snagged the net (old bits of boat, branches, etc.), the WRFT sweep netting team made its most successful sweep to date, catching well over 60 sea trout in the net. Of these, 36 were retained for measurement and lice counting.

Samples were also taken by sweep netting in May, June, July, August, September and October 2010. Many of the fish taken in August and thereafter were in their second or third summer at sea, with fewer post-smolts (pre-finnock). Although sample sizes were small (and all sites may be size selective in terms of the sea trout they support), Figure 1 suggests that the 2008 [blue] and 2009 [green] smolt year classes may have survived better than the 2010 [orange] smolt year class in Loch Gairloch. Further sampling is planned.

In 2010, lice numbers on sea trout in Loch Gairloch were again generally higher than on sea trout taken in Loch Ewe. Many of the larger fish (of over 300mm) had over 20 lice and dorsal fin damage associated with sea louse infection. The lousiest fish sampled was a post-smolt taken in Charleston Bay in May 2010, with 126 lice, mainly chalimus lice. Another post-smolt sea trout in the same sample had 76 mainly chalimus lice. These were very much the odd ones out: no other fish in the sample of 30 fish had more than 10 chalimus lice. It's possible that these fish had come into Loch Gairloch from elsewhere.

Winter 2011

In February – March 2011, 15 sea trout were taken in the sweep net, the size range of which was similar to that of February 2010 with mean length of 324mm (over-wintered finnock and sea trout). These fish were thin with an average condition factor of 0.69. All fish were infected with sea lice, with an average of 16.27 lice per fish (range 3 – 69 lice). Dorsal fins were tatty (average fin damage 0.69 on scale of 0 to 3, where '0' is for an intact fin and '3' is where over 2/3 of the fin are missing).

In addition to sea louse damage, some of these fish were very heavily infected with the parasite *Cryptocotyle lingua*, with up to an estimated 50 black spots per square centimetre of tailfin, suggesting an overall parasite burden of over 1000 cysts / fish. Some of the scales of sea trout have circular marks which have been attributed to *C. lingua* damage (see later in report).

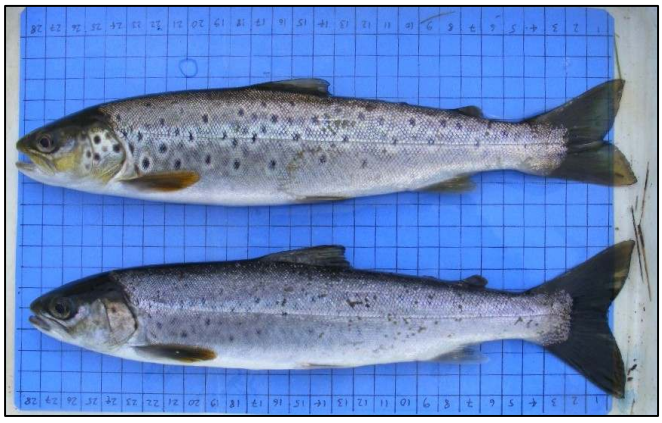
3.3 River Carron Estuary

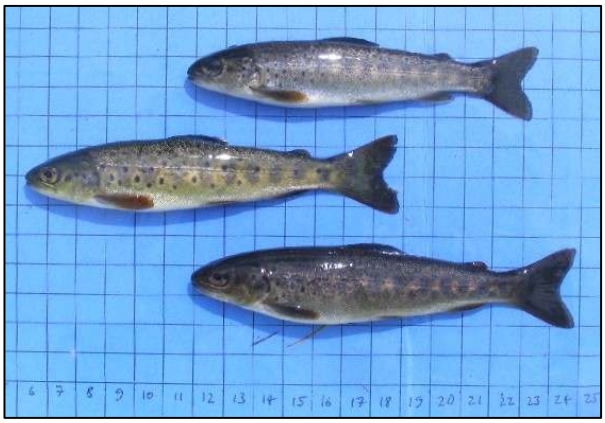
2009

The sea pool of the River Carron can only be successfully sampled using a sweep net when the river is at low levels. In 2009, a sweep netting attempt was aborted when the current was too strong for the sweep netting team who were pulled downstream. 7 fish were caught on 20th May 2009, none of which carried sea lice. These were assumed to be over-wintered sea trout on their way back to sea from freshwater. A single sea trout of 355mm was taken by rod and line on 21 July 2009, which carried 26 lice.

2010

Two successful sweep netting samples were taken during the summer. 33 fish were caught on the 16th June ranging in length from 112mm to 435mm. Larger fish were variable in colouration, some were very silvery; others were more yellow *(below left),* possibly indicative of an estuarine rather than fully marine habit. Most fish were lice free. 21 fish were infected with sea lice and on these fish lice levels varied from 1 to 65. 12 fish were less than 150mm in length and were regarded as small estuarine brown trout, possibly including stocked fish (*below right).* Although two of these fish each had 2 mobile lice, none of them carried attached lice: it's possible that mobile lice migrated onto them from other infected fish in the sampling bucket following capture.





River levels were too high during July 2010 to attempt to sweep the estuary pool. However, on 10th August, 60 trout were taken in a sweep from the sea pool. Most fish were lice free; only one fish (with 50 lice) had more than ten lice. Several fish had dorsal fin damage indicative of lice infection earlier in the summer and may therefore have been 'early returns'.

Condition factors were mostly less than 1.0, and fish were obviously thin for the time of year with little evidence having fed well in the estuary or at sea during preceding weeks. The fish with the highest condition factor from the sample were small trout, with no signs of lice infection, of between 192mm and 198mm, some of which may have been stocked.

2011

6 trout ranging in size from 345mm to 407mm, in apparently good condition (weighing scales faulty) were taken on 22 February 2011. There were no lice on any of these fish, nor any dorsal fin damage. One trout had a few *Cryptocotyle* spots, indicative of exposure to sea water.

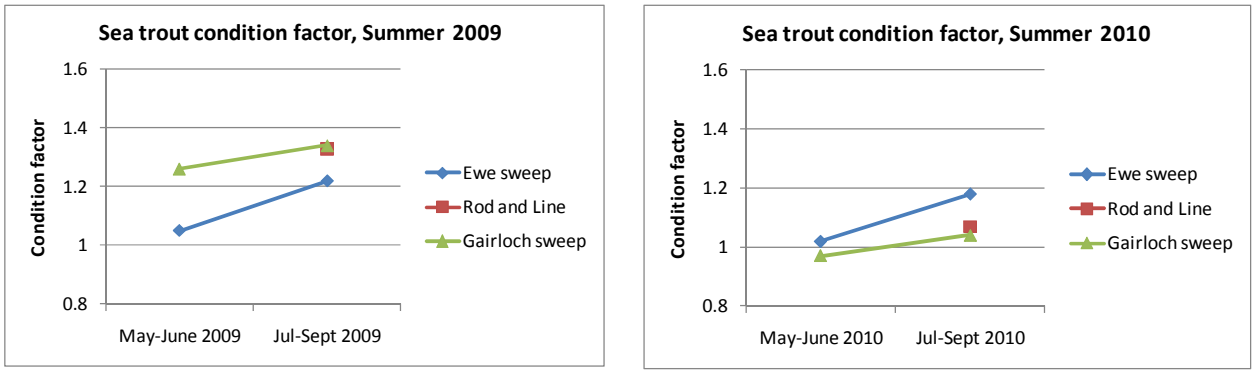
3.4 Condition factor comparison between Loch Ewe and Loch Gairloch and years '09 and '10

Samples sizes for Loch Ewe and Loch Gairloch (but not River Carron) enabled comparison between years. Sea trout sampled in both lochs had a higher condition factor during the summer of 2009 than in 2010 (Table 1 and Figure 2). In both years, the condition factor was higher in July – September than in May to June.

Table 1 Comparison between 2009 and 2010

	Ewe sweep	Rod and Line	Gairloch sweep
May-June 2009	1.05 (5)		1.26 (16)
Jul-Sept 2009	1.22 (18)	1.33 (6)	1.34 (7)
May-June 2010	1.02 (19)		0.97 (13)
Jul-Sept 2010	1.18 (11)	1.07 (2)	1.04 (16)

Figure 2 Changes in average condition factor of fish samples in 2009 and 2010 in Loch Ewe and Loch Gairloch.



The most obvious explanation for the recorded high condition factor for sea trout in summer 2009 was that there were many sandeels in local sea lochs. Sandeels, including small 'smolt-snack' sized 0+ (young of the year) sandeels, were seen by the snorkeler coming out of the back of the sweep net at Boor Bay on several occasions, and sampled in Loch Gairloch where the both Lesser and Greater Sandeels were present, (see picture on page 10) following otolith examination by Prof Barry Blake.

A remarkably 'fat' sea trout of 380mm, 800g (condition factor 1.46) taken in the sweep net at Boor Bay on 15th July 2009 (photo Ben Rushbrooke)

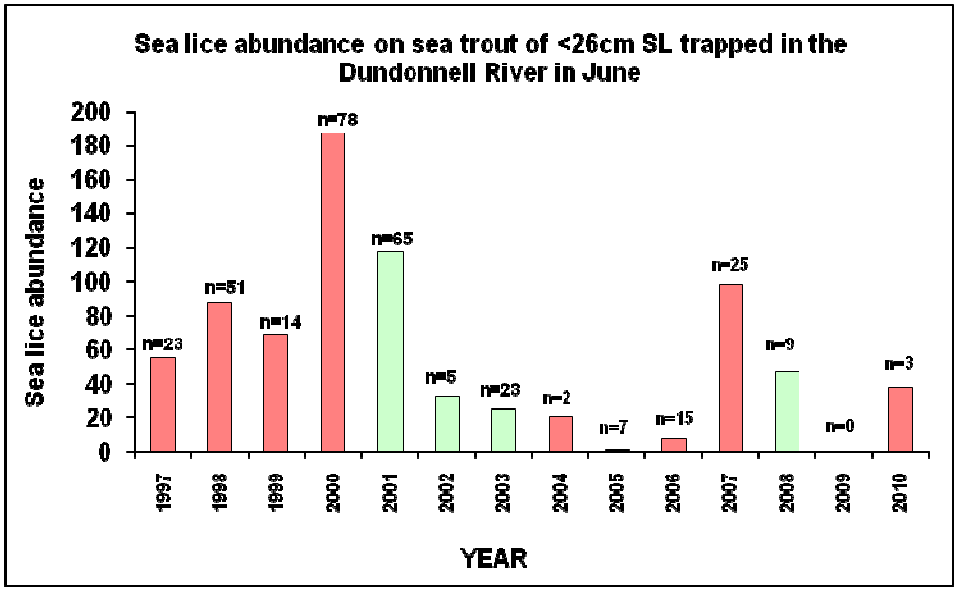
3.5 Dundonnell River fyke net report

A fyke net was set to fish near the top of the inter-tidal section of the Dundonnell River in 2009 and 2010 by Dundonnell Estate, to target early returning sea trout in June for sea lice monitoring purposes, as in previous years (see Cunningham, 2009). The fyke net was operated by Alasdair Macdonald, and fished over 32 tides above 4.0m between 5th June and 2nd July in 2009, and approximately 37 tides over 4.0m between 7th June and 3rd July in 2010.

In 2009 only one sea trout was taken, a seal damaged fish of 425mm (approx) with 12 pre-adult lice. In 2010, 6 sea trout were taken in June all but one of which were carrying lice. Three of these fish were less than 260mm. Figure 3 has been updated to show how sea trout and sea lice numbers have varied on smaller sea trout (including post-smolts) taken at this site in June over past 13 years.

On the 1st and 2nd of July 2010 another 12 sea trout were taken, all of which were carrying sea lice (ranging from 2 to 62). All but one of these fish had over 20 lice. The latter fish were all less than 260mm, thin, with damaged dorsal fins, and are regarded as early-returned fish.

Figure 3 Sea lice abundance on sea trout of less than 260mm in length trapped (and released) in the Dundonnell River in June.



3.6 Sea trout scale reading

The scale reading workshop on the 17th February 2011 provided an opportunity to investigate the ages and growth rates of the sea trout taken during the sampling programme. The aims of the workshop were as follows:

- to provide training for sea trout scale reading
- to provide some peer review of sea trout scale reading
- to age sea trout from which scale samples had been taken
- to learn about growth rates of sea trout from scale samples
- to prepare a photographic sea trout scale reading catalogue for future reference

The workshop was attended by 6 fisheries biologists, led by Dr Andy Walker. Ben Rushbrooke set up a digital camera to photograph and catalogue projected scale images. These, together with photographs of respective anaesthetised sea trout, and some interpretation of fish age and other information forms the main output of the workshop, and one which can be built upon over forthcoming years.

Sea trout scale reading is not as straightforward as salmon scale reading. A few samples of scales contained only 'replacement scales' from which it was not possible to obtain the freshwater age of fish. Some trout had grown almost as quickly in their final year in freshwater as in their first year at sea, making it sometimes difficult to be certain whether they were post-smolts or 'post-finnock' (fish that had already been to sea the previous summer). Some other larger trout of 400mm or more had no obvious 'spawning marks' so it was not as certain whether they had spawned or not.

However, for the majority of samples, some useful information relating to age could be obtained. Using the method described by Nall, 1930, measurements were taken from a small subset of scale samples to estimate rates of growth and fish lengths at respective ages (Table 4). Relatively few sea trout were in their second or later year since initial sea entry; so the table (Table 3) and graph (Figure 4) below are based on less data than hoped for. Perhaps this year 2011 we'll catch larger samples of older fish.

Table 3 and Figure 4 Average lengths of sea trout extrapolated from scale measurements, following method of Nall 1930.

Sea age (years since smolting)	**0**		**1**		**2**		**3**		**4**		**5**	
Loch Gairloch	150	8 fish	292	8 fish	395	4 fish	493	1 fish	538	1 fish	570	1 fish
Loch Ewe	167	5 fish	287	5 fish	369	2 fish						

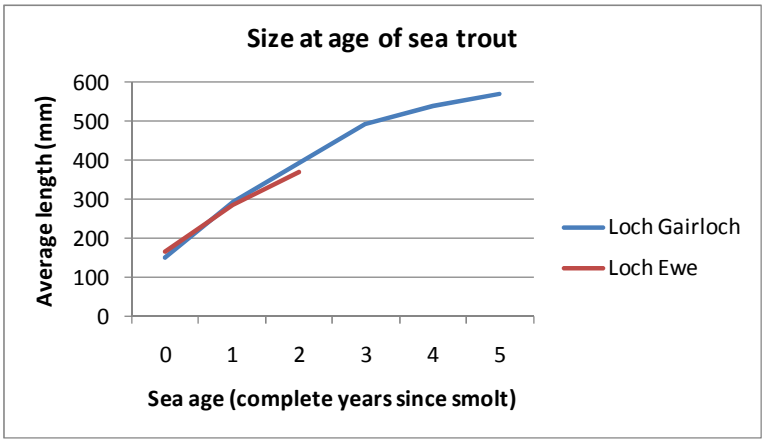
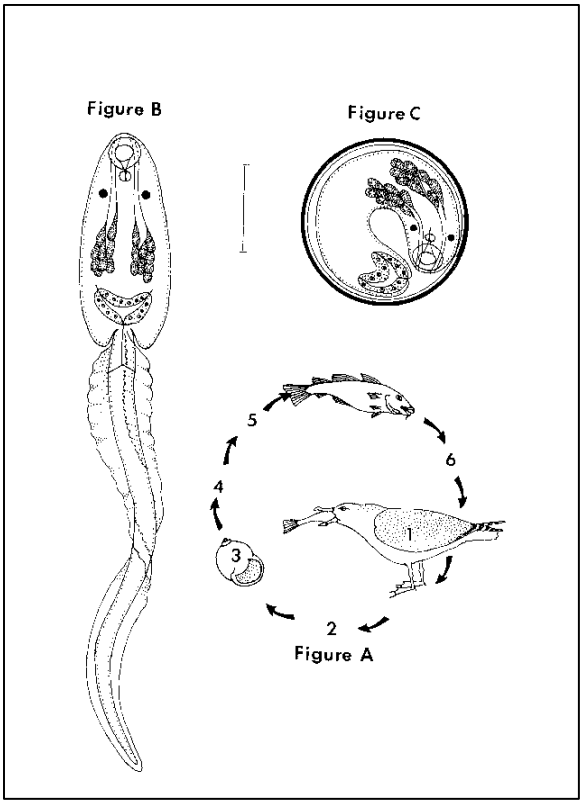


Table 4 Extrapolated fish lengths from measurements of winter checks on projected fish scales from sub-sample of sea trout.

Location	Date	Length (mm)	Total L.s.	Complete fish years				Extrapolated fish lengths					
				smolt age	sea age	total age	spawning marks	Smolt size (mm)	SW1 (mm)	SW2 (mm)	SW3 (mm)	SW4 (mm)	SW5 (mm)
Boor Bay (Loch Ewe)	15-Jul-09	161	13	1	0	1		70.84					
Boor Bay (Loch Ewe)	12-Aug-10	165	14	2	0	2		93.88					
Kerry Bay (Gairloch)	22-Jul-10	174	8	2	0	2		119.05					
Charleston (Gairloch)	29-Jun-10	181	0	?	0	?		117.65					
Boor Bay (Loch Ewe)	12-Aug-10	187	8	3	0	3		157.91					
Boor Bay (Loch Ewe)	15-Jul-09	188	29	2	0	2		104.85					
Boor Bay, Loch Ewe	12-Aug-10	193	11	3	0	3		158.69					
Boor Bay (Loch Ewe)	15-Jul-09	202	2	2	0	2		101.00					
Boor Bay (Loch Ewe)	15-Jul-09	206	21	2	0	2		146.64					
Boor Bay (Loch Ewe)	15-Jul-09	233	14	3	0	3		122.23					
Boor Bay (Loch Ewe)	15-Jul-09	235	9	3	0	3		165.23					
Boor Bay (Loch Ewe)	15-Jul-09	235	10	2	0	2		128.18					
Boor Bay (Loch Ewe)	15-Jul-09	236	6	3	0	3		152.26					
Boor Bay (Loch Ewe)	15-Jul-09	242	34	3	0	3		185.28					
Boor Bay (Loch Ewe)	15-Jul-09	252	40	4	0	4		185.01					
Charleston (Gairloch)	27-Aug-10	257	14	2	0	2		138.09					
Boor Bay (Loch Ewe)	15-Jul-09	257	17	3	0	3		159.27					
Inverasdale (Loch Ewe)	03-Aug-10	271	4	2	0	2		138.45					
River Ewe	16-Jul-10	311	0	2	1	3		178.31	290.27				
Charleston (Gairloch)	01-Feb-10	313	12	2	0	2		154.16					
Kerry Bay (Gairloch)	22-Jul-10	318	37	2	1	3		140.07	276.36				
Charleston (Gairloch)	01-Feb-10	330	6	2	1	3	1	143.00	275.00				
Inverasdale (Loch Ewe)	03-Aug-10	351	67	2	1	3		125.01	288.49				
Kerry Bay (Gairloch)	22-Jul-10	370	16	2	1	3		160.21	324.23				
Charleston (Gairloch)	27-Aug-10	378	6	2	1	3		162.83	284.95				
Boor Bay (Loch Ewe)	15-Jul-09	380	20	3	1	4		192.04	314.62				
Charleston (Gairloch)	27-Jul-10	393	18	2	2	4	1	138.71	268.16	346.76			
Boor Bay (Loch Ewe)	15-Jul-09	395	24	2	2	4		162.05	243.08	344.36			
Charleston (Gairloch)	29-Jun-10	406	14	?	2	?		140.35	240.59	375.93			
River Ewe	16-Jul-10	430	1	2	2	4	1	177.69	298.51	394.46			
Charleston (Gairloch)	27-Aug-10	435	14	?	2	?	1	174.00	301.15	401.54			
Kerry Bay (Gairloch)	07-Jun-10	590	25	?2	5	8	4	207.47	363.08	453.85	492.75	538.13	570.00

3.7 Cryptocotyle infection (black spot)

The fluke, *Cryptocotyle lingua,* is a digenean trematode which causes 'black spot' disease of fish. The parasite has a complex life cycle requiring three hosts: a gastropod mollusc, normally the Common Periwinkle, *Littorina littorea*; a fish (e.g. Butterfish, gurnards, Cod, Pollack, and sea trout), and finally a fish eating bird, usually a gull *Larus* spp.. Other vertebrates in which *Cryptocotyle lingua* flukes have been recorded include White-tailed eagle, North American Mink, Otter and Harbour Seal.



Life cycle of *Cryptocotyle lingua*, drawing by Brenda Matthews, University of Plymouth.
www.glaucus.org.uk/atherina.htm

The life stages numbered are as follows:

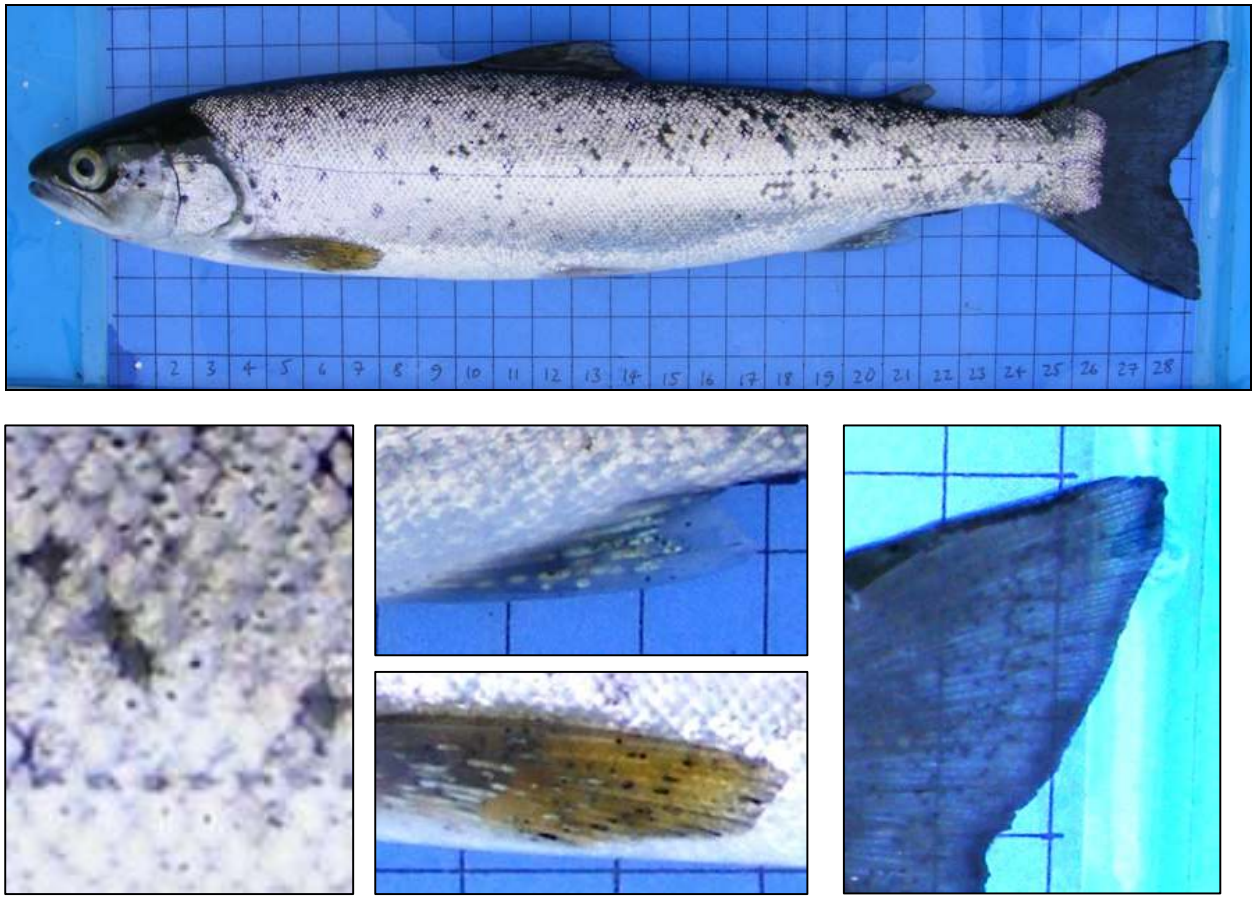
1. Sea bird, e.g. gull
2. Free swimming stage
3. Mollusc, usually (but not always) the winkle, *Littorina*
4. Second free swimming stage (?shown in Figure B)
5. Fish, e.g. butterfish (Gunnel), rockling or bullhead (with encysted fluke shown in Figure C)

Sea trout and other fish with *Cryptocotyle lingua* infection have been recorded from all WRFT sweep netting sites, and indeed the presence of this parasite on sea trout has be used as an indicator that the fish has been in the marine environment.

Juvenile Grey Gurnard, heavily infected with ?Cryptocotyle lingua, Kerry Bay, Loch Gairloch 12 August 2008

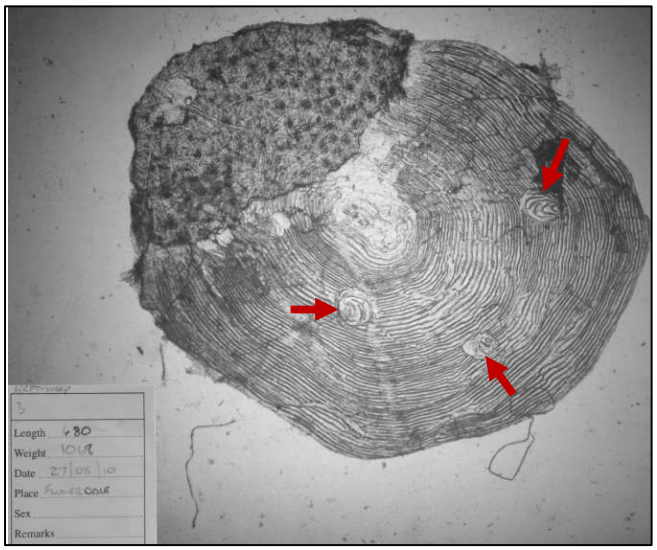
In 2010 and 2011 some of the fish taken in Loch Gairloch had particularly dense black spotting attributed to *Cryptocotyle lingua* infection. As a measure of infection levels, an estimate of the number of black spots per cm^2 of tail fin was recorded, with up to 50 spots per cm^2 on some of the sea trout taken in Charleston Harbour. Scale samples from some sea trout taken in Loch Gairloch had circular marks which have been interpreted as *Cryptocotyle lingua* marks.

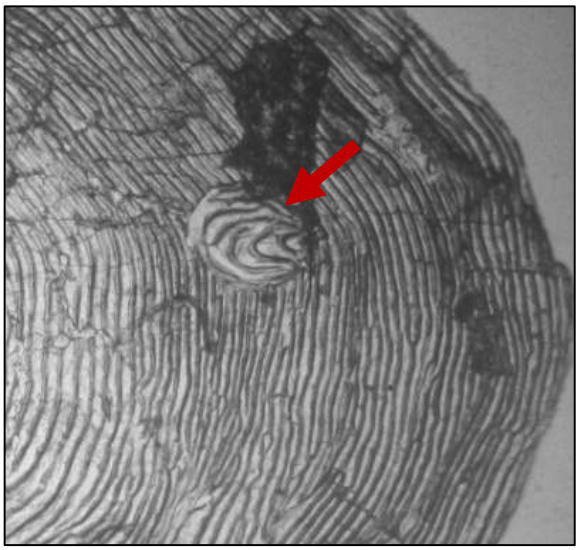
Black spots ?Cryptocotyle lingua cysts on a sea trout taken on 18 March 2011 in Charleston Harbour, Gairloch



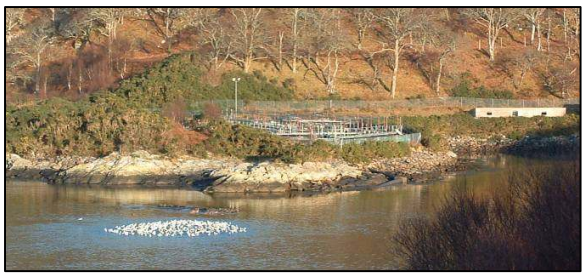
Black spots (?Cryptocotyle lingua cysts) on sea trout taken in Charleston Bay 23 September 2010.

Scale from a sea trout of 480mm taken in Charleston Bay, Gairloch 27th August 2010,





The high prevalence of *?Cryptocotyle lingua* may be related to high densities of other hosts. Byers *et al* (2008) investigated the '*Controls of spatial variation in the prevalence of trematode parasites infecting a marine snail'* and concluded that '*Trematode prevalence appears to be predominantly determined by local site characteristics favoring high gull abundance'*. In Loch Gairloch, particularly high numbers of gulls (300++) and ducks (including up to 200 Goldeneye during winter months) congregate around the discharge pipe of the Inverkerry Salmon farm (*below*) close to where sea trout have been sampled. Rocky shores and mussel beds nearby may provide ideal habitat for winkles. Further investigations may be worthwhile.



Seagulls and ducks congregate around the outflow pipe from Inverkerry fish farm particularly in winter: 500+ birds? [Photos taken in winter 2006].

In addition to gulls and other sea birds, other final hosts for *Cryptocotyle lingua* flukes can include Harbour Seal and Otter (McCarthy & Hasset, 1993). Given the conservation status of these mammals, and their occurrence within the area, it might be worth assessing whether the high densities of *C. lingua* cysts on intermediate fish hosts, presents a significant health risk to Common Seal and Otter populations in the area. It should be said that both species are apparently relatively common in Loch Gairloch and the WRFT biologist is unaware of any conservation concerns for their status within the local area.

3.8 Predation and sea trout survival

Some of the sea trout had scale damage, mostly with symmetrical marks on either side of the dorsum attributed to heron or other bird. Three fish (2 at Charleston, one at Dundonnell) had clearly been attacked by a larger predator, with bite wounds; thought to be that of a seal.

Predator damaged sea trout caught in Charleston Bay on 23rd September 2010.

Six of the 14 sea trout taken in Charleston Bay in March 2011 had marks indicative of predator damage, a much higher proportion than at other sites sampled. Sea trout over-wintering in the sea when water temperatures are cold may be more vulnerable to predation than those that over-winter in freshwater lochs. The 'warm-blooded' predators, Harbour Seal, Otter, Red-breasted Merganser, Cormorant and Heron were seen fishing in the estuary or known to visit on an almost daily basis during the winter of 2011. As the speed at which 'cold-blooded' fish are able to swim relates to water temperature (and may also relate to parasite burdens), sea trout may be most vulnerable to being caught by a seal in the sea during winter months.

These predators were also recorded in the Dundonnell River estuary and around the head of Little Loch Broom in June 2010 (up to 20 mergansers were seen together). Early-returned sea trout with damaged dorsal fins may have been more vulnerable to predation than healthier fish in this area.

3.9 Other species taken

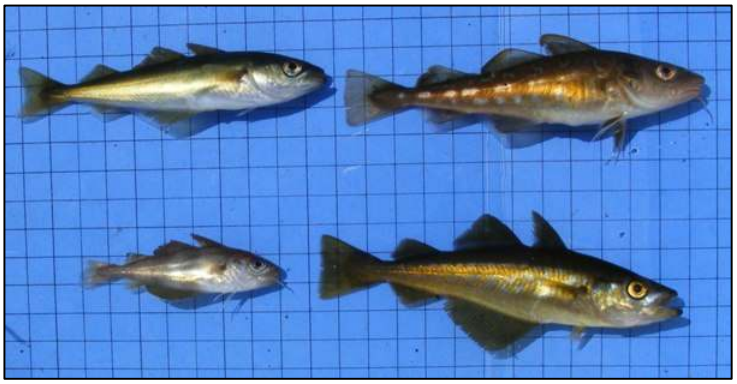
In addition to sea trout, many other fish species were taken in sweep net samples. These include juvenile Pollack, Coalfish, Cod, several species of wrasse, Flounder (and possibly also juvenile place), Mackerel, Sprat, sandeels (discussed earlier), 15-Spined Stickleback, Long-spined Sea Scorpion, and even a juvenile squid. Length data is available for most of these, or for sub-samples where numbers taken were high (e.g sprats, sandeels, juvenile Pollack). Some of these other fish are shown below.

Corkwing Wrasse (left) taken in the sweep net at Boor Bay on 12th June. This is the Wrasse species most commonly taken at the site and is thought to breed nearby.

Goldsinny Wrasse (right) taken in the sweep net at Boor Bay on 13th September 2010. Some fish farm companies have recently requested permission from the Scottish Government to commercially harvest wrasse to help delouse farmed salmon.

This Ballan Wrasse (left) was taken in the Charleston Bay sweep net sample on 23rd September 2010.

(clockwise from top left) juvenile Coalfish, Cod, Pollack and Bib from the sweep net sample at Boor Bay on 15th July 2009, which also included some of the fattest sea trout sampled. Sea trout may have been feeding on small gadids such as these species in addition to juvenile+ [young of the year] sandeels present nearby.



3.10 An appraisal of sampling method and efficiency

The sweep netting protocol standardises for fish capture *method*. However, the method does not standardise for *habitat*. As sea trout of different sizes and ages are likely to utilise different areas of the coast for different reasons at different times, samples may not always be representative of the local sea trout population, in terms of their demography, and health status.

For the purposes of interpreting sea lice infection levels the following should be considered:

1. Sampling (irrespective of method of capture) in river estuaries and the lower sea pools of rivers

- samples in May and June may include sea trout which are on their way to sea and have not yet been fully exposed to the sea louse infection pressures present in the sea nearby
- samples may include sea trout which are estuarine in habit and feed in brackish water or move in and out of freshwater on a regular basis, perhaps moving out over saltmarsh at high tide (e.g. yellower trout of the River Carron)
- samples may include sea trout which have returned-early from the sea back to freshwater because of sea lice infection (or for other reasons). Some of these fish may have lost some or all of their sea lice if they have been back in freshwater for a week or more.

Interpretation of data sets from estuarine samples is therefore problematic; each fish may have a different story to tell; fish which have little in common may be grouped together. Nevertheless, so far as sea lice monitoring is concerned, because of the tendency of sea trout which are heavily infected with sea lice to head for freshwater, estuarine samples are the ones most likely to include the most unhealthy fish. An example of a sample of this sort is the one taken in the River Carron on 10th August 2010. There were over 50 fish in this sample, the majority of which had very few lice when sampled. The sample was thought to include fish of all the above categories. A further sampling problem is that some fish may have picked up lice from other fish in the net or sampling bucket following capture.

2. Sampling at beach sites away from river estuaries (e.g. Boor Bay, Inverasdale Shore and Kerry Bay).

- samples taken in May and June, and even in early July may include fish which have only recently entered freshwater.
- samples are more likely to include healthy feeding fish. To date, the sea trout with highest condition factors (above 1.4) have been taken from beach sites.
- because sea trout spread out once they leave river estuaries, fish densities are usually lower than in estuary sites.

Some of the largest beach sweep netting samples have been taken when the wind has been on-shore (e.g. 15 July 2009, Boor Bay. This may relate to both wave action provide camouflage for sweep netting crew, on-shore wave action stirring up food for bait fish, and a thicker fresh – brackish layer along the beach when the wind is on-shore than when it is offshore.

Although salinity was not recorded at sampling sites, the water column was evidently often stratified with a fresher water layer above a more saline layer. The interface between the two layers was observed by the snorkeler as a fuzzy zone between fresh and salt water, and varied from less than 10cm to sometimes much more than this according to wind location and nearby freshwater input. Within coastal parts of Wester Ross, the freshwater layer, its location and depth (both influenced by wind direction) may be of considerable significance to the occurrence of sea trout in the sea, and to sea lice infection pressure.

4. Conclusions

- 2009 was a good year for sea trout in both Loch Gairloch and Loch Ewe in terms of marine growth. Sea trout were sampled from both lochs in July with condition factors exceeding 1.4.

- 2010 was a less good year for sea trout in Loch Ewe and Loch Gairloch in terms of growth with only a few fish sampled with condition factor as high as 1.3. Most of the fish sampled during the summer were thin, with condition factors nearer 1.0. Sea trout caught in the River Carron estuary were also thin.

- Small (<26cm), thin, early-returned sea trout with 20 – 62 lice per fish were taken in the Dundonnell River and Gruinard River in June and early July 2010, suggesting lice problems in nearby waters. Data from sea trout sampled by sweep netting from the River Kanaird in 2009 and 2010 was not available for this report.

- The largest and oldest sea trout was a fish of 590mm taken from Kerry Bay in 2010. From limited data, sea trout in Loch Gairloch appear to have grown slightly faster than in Loch Ewe. Further sampling required to substantiate this.

- Sea lice (*L. salmonis*) infection levels recorded were not as high in 2009 and 2010 as in some other years within nearby waters (e.g. Loch Ewe in 2007). However, some fish from both sites had some damage to dorsal fins associated with sea louse infection, with lice levels exceeding 30 lice per fish on some fish in both Loch Ewe and Loch Gairloch in both years.

- The lousiest fish seen during the sampling period was a post-smolt sea trout with 126 sea lice taken in Charleston Bay in May 2010. The lousiest fish sampled in Loch Ewe was a sea trout of length 351mm with 67 lice caught in August 2010 from the Inverasdale shore.

- Sea trout carrying sea lice were caught in the sea in February – March in Loch Gairloch in both 2010 and 2011, demonstrating for the first time to WRFT that some sea trout over-winter at sea.

- Many of the Sea trout in Loch Gairloch were heavily infected with 'black spots': cysts of the trematode parasite, thought to be *Cryprocotyle lingua*. Marks on sea trout scales have been attributed to this parasite. The high abundance of this parasite on sea trout and other fish in Loch Gairloch may relate to a high number of sea gulls attracted to the Inverkerry salmon farm outflow.

- This report highlights (1) food availability, (2) predation, and (3) infection by *Cryptocotyle lingua,* in addition to (4) sea lice (*Lepeophtheirus salmonis*) infection as factors which contribute to the survival and growth of sea trout in the marine environment. However, there was no evidence that the three former factors can be as damaging to sea trout populations as sea lice epizootics of the severity seen in the Dundonnell River (e.g. in 2007), River Ewe in 2003 and 2007 (documented in Cunningham, 2009), and in Loch Torridon in 2007 when sea trout carrying >100 lice were recorded back in freshwater within a few days of sea entry (Raffell *et al*, 2007).

5. Recommendations

1. The comparability of different methods of sampling (e.g. sweep netting with rod and line) should be assessed. An assessment could be carried out in the River Carron estuary or River Kanaird estuary by sweep netting and rod and line sampling consecutively within a few days of each other, then repeating the exercise at intervals thereafter. A rod and line sample can sometimes be take more easily and efficiently (using less man-hours) than a sweep netting sample. It's possible that healthier, well fed fish would be less inclined to take a fly than early-returned sea trout. Even if this were the case, rod and line sampling might nevertheless be the most efficient and cost-effective way of obtaining a sample of early-returned sea trout to answer the question: is there a sea lice problem affecting sea trout in nearby waters?

2. A comparative exercise between estuary and beach sites could also be carried out by contrasting catches with those from a beach site nearby (e.g. for Kanaird estuary pool *vrs.* Ardmair beach), using both sweep netting and rod and line sampling to obtain separate samples. Anglers with local knowledge may be able to provide advice of where, when and how to fish.

3. Food availability in Loch Ewe may be of considerable importance to the survival and growth of sea trout, particularly in their first few weeks at sea (c. 2009 vs. 2010 sea trout condition). For this reason, Ewe salmon and sea trout fisheries interests should actively engage with other conservation interests in efforts to protect habitats of importance for juvenile fish populations (e.g. sandeels, herrings and sprats, juvenile gadids) within Loch Ewe. These habitats include *Maerl* beds, eelgrass beds and biogenic reefs and areas of sediment or shell-shingle substrate where herrings, sprat and sandeels may spawn. The Scottish Government's Marine Protected Area programme should be supported.

4. Further investigations should be carried out to confirm the identity of the parasite thought to be *Cryptocotyle lingua* associated with 'black spot' of sea trout. There is no evidence that the local seal or otter populations is adversely affected by the occurrence of high number of cysts on wild fish in the area, however it would be worth understanding whether this is indeed the case.

5. Efforts should be made to tag sea trout, particularly in the Loch Gairloch sampling area. Some of these fish may wander into Loch Torridon or have come from there, where sea trout are sampled as part of the Sea trout sampling programme.

6. The smolt production potential of sea trout in smaller streams entering the sea should be reviewed. To what extent do small streams contribute to the overall sea trout population around Wester Ross?

7. This report has highlighted three other factors contributing to the growth and survival of sea trout in the marine environment. However, the potential for infection by the sea louse *Lepeophtheirus salmonis* remains the biggest threat to sea trout in coastal waters, and should remain the focus of future monitoring and management efforts.

6. Acknowledgements

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Appendix 1: Sea lice data for trout sampled by WRFT in 2009 - 2011 (sweep netting funded by the Scottish Government via the TWG)

								Caligus	*Lepeophtheirus salmonis*						*Cryptocotyl lingua*		
Fish no.	Location	Date	Method	Riv /Est / Beach	Length (mm)	Weight (g)	Condition factor	total	copepodid & chalimus	Pre-adult & adult	Ovigerous female	Total *L. salmonis*	Dorsal damage	Lice scars		Predator damage	Comments
1	River Carron	20-May-09	Sweep	Estuary	405	660	0.99	0	0	0	0	0	0	n		n	
2	River Carron	20-May-09	Sweep	Estuary	261	220	1.24	0	0	0	0	0	0	n			
3	River Carron	20-May-09	Sweep	Estuary	321	355	1.07	0	0	0	0	0	0	n			
4	River Carron	20-May-09	Sweep	Estuary	378	535	0.99	0	0	0	0	0	0	n			
5	River Carron	20-May-09	Sweep	Estuary	373	440	0.85	0	0	0	0	0	0	n			
6	River Carron	20-May-09	Sweep	Estuary	300	300	1.11	0	0	0	0	0	0	n			
7	River Carron	20-May-09	Sweep	Estuary	340	387	0.98	0	0	0	0	0	0	n			
8	Boor Bay	22-May-09	Sweep	Beach	230	122	1.00	0	0	0	0	0	0	n	no	0	no *Cryptocotyl* - fresh smolt
9	Boor Bay	22-May-09	Sweep	Beach	360	470	1.01	0	4	15	2	21	1	n		yes	orange mark under chin
10	Poolewe	08-Jun-09	Gill	Estuary	345			0	0	0	0	0	0	n		n	
11	Charleston Bay	10-Jun-09	Sweep	Beach	147	40	1.26	0	0	0	0	0	0	n		n	tail eroded
12	Kerry Bay	16-Jun-09	Sweep	Beach	163	52	1.20	0	0	1	0	1	0	n		yes	
13	Kerry Bay	16-Jun-09	Sweep	Beach	192	83	1.17	0	0	2	2	4	0	n			
14	Kerry Bay	16-Jun-09	Sweep	Beach	196	100	1.33	0	0	0	0	0	0	n	yes		
15	Kerry Bay	16-Jun-09	Sweep	Beach	315	342	1.09	0	0	4	1	5	0	n		N	
16	Boor Bay	22-Jun-09	Sweep	Beach	147	35	1.10	0	0	0	0	0	0	n		n	
17	River Carron	23-Jun-09	Sweep	Estuary	161			0	0	0	0	0	0	n			
18	Charleston Bay	24-Jun-09	Sweep	Estuary	163	57	1.32	0	0	1	0	1	0	n	yes	N	
19	Kerry Bay	29-Jun-09	Sweep	Beach	172	63	1.24	0	5	2	0	7	0	n		n	
20	Kerry Bay	29-Jun-09	Sweep	Beach	197	96	1.26	0	12	5	0	17	1	n		y	
21	Kerry Bay	29-Jun-09	Sweep	Beach	203	106	1.27	0	2	1	0	3	0	n		n	
22	Kerry Bay	29-Jun-09	Sweep	Beach	213	127	1.31	0	2	4	4	10	0	n		n	
23	Kerry Bay	29-Jun-09	Sweep	Beach	221	134	1.24	0	12	8	1	21	1	n		n	
24	Kerry Bay	29-Jun-09	Sweep	Beach	222	130	1.19	0	23	12	5	40	1	y		n	
25	Kerry Bay	29-Jun-09	Sweep	Beach	255	230	1.39	0	10	15	4	29	0	n		y	
26	Kerry Bay	29-Jun-09	Sweep	Beach	370	727	1.44	0	6	17	13	36	1.5	n		n	
27	Kerry Bay	29-Jun-09	Sweep	Beach	373	655	1.26	0	28	13	11	52	1	n		n	
28	Kerry Bay	29-Jun-09	Sweep	Beach	395	695	1.13	0	8	4	4	16	0	n		y	
29	Boor Bay	30-Jun-09	Sweep	Beach	160	38	0.93	0	4	1	0	5	0	y		n	
30	Boor Bay	30-Jun-09	Sweep	Beach	215	118	1.19	0	4	6	0	10	0	y		n	
31	Inverasdale	30-Jun-09	Sweep	Beach	178	63	1.12	0	11	7	0	18	0	y		n	
32	Dundonnell	30-Jun-09	Fyke	Estuary	425			0	0	12	0	12	0	0		Y	seal damaged
33	River Ewe	09-Jul-09	Rod	River	230			0	10	5	0	15	0.5	n		n	
34	River Ewe	09-Jul-09	Rod	River	235			0	1	10	0	11	0	n		n	
35	River Ewe	09-Jul-09	Rod	River	240			0	5	6	1	12	0	n		n	
36	River Ewe	09-Jul-09	Rod	River	243			0	0	12	0	12	0	n			scale damage
37	River Ewe	09-Jul-09	Rod	River	250			0	2	5	0	7	0	n		n	
38	River Ewe	09-Jul-09	Rod	River	250			0	0	13	0	13	0	y		n	

39	River Ewe	09-Jul-09	Rod	River	252			0	0	0	0	0	0.5	y		n	
40	River Ewe	10-Jul-09	Rod	River	228	158	1.33	0	0	2	1	3	0	y		n	
41	River Ewe	10-Jul-09	Rod	River	239	190	1.39	0	4	9	1	14	1	y		n	
42	River Ewe	10-Jul-09	Rod	River	241	187	1.34	0	4	3	1	8	0.5	y		n	
43	River Ewe	10-Jul-09	Rod	River	244	191	1.31	0	5	5	2	12	0.5	y		n	
44	River Ewe	10-Jul-09	Rod	River	258	230	1.34	0	10	12	3	25	0.5	y		n	
45	River Ewe	10-Jul-09	Rod	River	270	261	1.33	0	12	7	3	22	1	y		n	
46	Boor Bay	15-Jul-09	Sweep	Beach	161	55	1.32	4	12	1	0	13	0	y		n	
47	Boor Bay	15-Jul-09	Sweep	Beach	188	85	1.28	2	15	14	0	29	1	y		n	
48	Boor Bay	15-Jul-09	Sweep	Beach	202	106	1.29	0	0	1	1	2	0	y		n	
49	Boor Bay	15-Jul-09	Sweep	Beach	206	115	1.32	0	10	11	0	21	0	y		n	
50	Boor Bay	15-Jul-09	Sweep	Beach	233	162	1.28	1	5	9	0	14	0	y		n	
51	Boor Bay	15-Jul-09	Sweep	Beach	235	167	1.29	0	8	2	0	10	1	y		n	
52	Boor Bay	15-Jul-09	Sweep	Beach	235	152	1.17	0	5	4	0	9	0	y		n	
53	Boor Bay	15-Jul-09	Sweep	Beach	236	181	1.38	0	3	3	0	6	0	y		n	
54	Boor Bay	15-Jul-09	Sweep	Beach	239	196	1.44	6	6	6	0	12	0	y		n	
55	Boor Bay	15-Jul-09	Sweep	Beach	242	179	1.26	1	27	7	0	34	1	y		n	
56	Boor Bay	15-Jul-09	Sweep	Beach	252	190	1.19	1	32	8	0	40	0	y		yes (old)	
57	Boor Bay	15-Jul-09	Sweep	Beach	257	221	1.30	1	6	10	1	17	0	y		n	
58	Boor Bay	15-Jul-09	Sweep	Beach	308	390	1.33	0	0	3	1	4	0	y		n	
59	Boor Bay	15-Jul-09	Sweep	Beach	380	800	1.46	1	1	15	4	20	0	y		n	
60	Boor Bay	15-Jul-09	Sweep	Beach	395	750	1.22	0	12	12	0	24	2	y		n	
61	Kerry Bay	16-Jul-09	Sweep	Beach	227			0	19	23	2	44	0	y			weigh scales faulty
62	Kerry Bay	16-Jul-09	Sweep	Beach	230			2	33	22	7	62	0	y			weigh scales faulty
63	Kerry Bay	16-Jul-09	Sweep	Beach	240			0	34	26	3	63	1	y			weigh scales faulty
64	Kerry Bay	16-Jul-09	Sweep	Beach	360	630	1.35	5	9	15	6	30	1	y		n	clipped adipose - 2008?
65	Kerry Bay	16-Jul-09	Sweep	Beach	378	695	1.29	6	42	27	5	74	1	y			
66	Kerry Bay	16-Jul-09	Sweep	Beach	387	360	0.62	3	28	26	25	79	1	y		n	vent damage
67	River Carron	21-Jul-09	Rod & line	Estuary	355			0	6	15	4	26	0	y		n	
68	Charleston Bay	11-Aug-09	Sweep	Estuary	301	381	1.40	0	12	25	11	48	1	y		n	no photo
69	Boor Bay	19-Aug-09	Sweep	Beach	182	67	1.11	0	1	1	1	3	0	n		n	
70	Boor Bay	19-Aug-09	Sweep	Beach	186	71	1.10	0	0	1	0	1	0	n		n	
71	Boor Bay	19-Aug-09	Sweep	Beach	236	140	1.07	0	33	14	1	48	0	n		n	
72	Charleston Bay	01-Feb-10	Sweep	Estuary	450			0	0	2	1	3	1				old erosion on dorsal fin
73	Charleston Bay	01-Feb-10	Sweep	Estuary	370			0	2	1	1	4	1				old erosion on dorsal fin
74	Charleston Bay	01-Feb-10	Sweep	Estuary	350			0	0	1	1	2	0				
75	Charleston Bay	01-Feb-10	Sweep	Estuary	300			0	6	1	0	7	0				
76	Charleston Bay	01-Feb-10	Sweep	Estuary	371			0	2	1	1	4	1				old erosion on dorsal fin
77	Charleston Bay	01-Feb-10	Sweep	Estuary	272			0	0	2	0	2	0				
78	Charleston Bay	01-Feb-10	Sweep	Estuary	313			0	6	6	0	12	0				
79	Charleston Bay	01-Feb-10	Sweep	Estuary	260			0	0	0	0	0	0				
80	Charleston Bay	01-Feb-10	Sweep	Estuary	304			0	0	0	0	0	0				

81	Charleston Bay	01-Feb-10	Sweep	Estuary	270			0	2	3	0	5	0				
82	Charleston Bay	01-Feb-10	Sweep	Estuary	203			0	0	0	0	0	0				
83	Charleston Bay	01-Feb-10	Sweep	Estuary	283			0	0	0	0	0	0				
84	Charleston Bay	01-Feb-10	Sweep	Estuary	375			0	3	6	3	12	1				
85	Charleston Bay	01-Feb-10	Sweep	Estuary	380			0	10	7	0	17	0				
86	Charleston Bay	01-Feb-10	Sweep	Estuary	281			0	0	0	0	0	0				
87	Charleston Bay	01-Feb-10	Sweep	Estuary	330			0	0	6	0	6	0.5				
88	Charleston Bay	01-Feb-10	Sweep	Estuary	372			0	1	1	2	4	0				
89	Charleston Bay	01-Feb-10	Sweep	Estuary	282			0	3	3	0	6	0				
90	Charleston Bay	01-Feb-10	Sweep	Estuary	341			0	2	4	0	6	0				
91	Charleston Bay	01-Feb-10	Sweep	Estuary	303			0	2	4	0	6	0				
92	Charleston Bay	01-Feb-10	Sweep	Estuary	327			0	3	4	0	7	0				
93	Charleston Bay	01-Feb-10	Sweep	Estuary	393			0	2	3	2	7	0				
94	Charleston Bay	01-Feb-10	Sweep	Estuary	307			0	0	3	1	4	0				
95	Charleston Bay	01-Feb-10	Sweep	Estuary	274			0	5	2	2	9	0				
96	Charleston Bay	01-Feb-10	Sweep	Estuary	315			0	3	2	0	5	0				
97	Charleston Bay	01-Feb-10	Sweep	Estuary	297			0	9	2	0	11	0.5				
98	Charleston Bay	01-Feb-10	Sweep	Estuary	270			0	4	1	0	5	0				
99	Charleston Bay	01-Feb-10	Sweep	Estuary	381			0	4	8	1	13	0				
100	Charleston Bay	01-Feb-10	Sweep	Estuary	304			0	1	3	0	4	0				
101	Charleston Bay	01-Feb-10	Sweep	Estuary	270			0	2	0	0	2	0				
102	Charleston Bay	01-Feb-10	Sweep	Estuary	292			0	2	0	1	3	0				
103	Charleston Bay	01-Feb-10	Sweep	Estuary	282			0	2	5	0	7	1				distended belly
104	Charleston Bay	01-Feb-10	Sweep	Estuary	278			0	4	3	0	7	0				
105	Charleston Bay	01-Feb-10	Sweep	Estuary	280			0	2	1	0	3	0		bird damage		
106	Charleston Bay	01-Feb-10	Sweep	Estuary	289			0	3	4	0	7	0				
107	Charleston Bay	01-Feb-10	Sweep	Estuary	229			0	0	1	0	1	0				
108	Charleston Bay	29-May-10	Sweep	Estuary	155			0	6	2	8	8	0			n	
109	Charleston Bay	29-May-10	Sweep	Estuary	180			0	0	0	0	0	0			n	
110	Charleston Bay	29-May-10	Sweep	Estuary	155			0	0	0	0	0	0			n	
111	Charleston Bay	29-May-10	Sweep	Estuary	148			0	0	0	0	0	0			n	
112	Charleston Bay	29-May-10	Sweep	Estuary	392			0	2	16	1	19	1			n	
113	Charleston Bay	29-May-10	Sweep	Estuary	150			0	0	0	0	0	0			n	
114	Charleston Bay	29-May-10	Sweep	Estuary	145			0	3	1	0	4	0			n	
115	Charleston Bay	29-May-10	Sweep	Estuary	192			0	8	0	0	8	0			n	
116	Charleston Bay	29-May-10	Sweep	Estuary	125			0	1	0	0	1	0			n	
117	Charleston Bay	29-May-10	Sweep	Estuary	300			0	1	19	3	23	0		yes	n	heavy cryptocotyl infection
118	Charleston Bay	29-May-10	Sweep	Estuary	149			0	0	0	0	0	0			n	
119	Charleston Bay	29-May-10	Sweep	Estuary	140			0	0	0	0	0	0			n	
120	Charleston Bay	29-May-10	Sweep	Estuary	180			0	126	0	0	126	0			n	

121	Charleston Bay	29-May-10	Sweep	Estuary	172			0	5	1	0	6	0			n	
122	Charleston Bay	29-May-10	Sweep	Estuary	155			0	74	0	0	74	0			bird	
123	Charleston Bay	29-May-10	Sweep	Estuary	158			0	8	0	0	8	0			n	
124	Charleston Bay	29-May-10	Sweep	Estuary	140			0	4	0	0	4	0			n	
125	Charleston Bay	29-May-10	Sweep	Estuary	142			0	4	0	0	4	0			n	
126	Charleston Bay	29-May-10	Sweep	Estuary	169			0	1	0	0	1	0			n	
127	Charleston Bay	29-May-10	Sweep	Estuary	132			0	0	0	0	0	0			n	
128	Charleston Bay	29-May-10	Sweep	Estuary	142			0	0	0	0	0	0			n	
129	Charleston Bay	29-May-10	Sweep	Estuary	141			0	3	0	0	3	0			n	
130	Charleston Bay	29-May-10	Sweep	Estuary	162			0	12	2	0	14	0			n	
131	Charleston Bay	29-May-10	Sweep	Estuary	125			0	0	0	0	0	0			n	
132	Charleston Bay	29-May-10	Sweep	Estuary	275			0	7	1	1	9	0			n	adipose fin clipped
133	Charleston Bay	29-May-10	Sweep	Estuary	175			0	15	0	0	15	0			n	
134	Charleston Bay	29-May-10	Sweep	Estuary	139			0	0	0	0	0	0			n	
135	Charleston Bay	29-May-10	Sweep	Estuary	125			0	0	0	0	0	0			n	
136	Charleston Bay	29-May-10	Sweep	Estuary	150			0	2	0	0	2	0			n	
137	Charleston Bay	29-May-10	Sweep	Estuary	176			0	0	0	0	0	0			n	
138	Boor Bay	02-Jun-10	Sweep	Beach	158	36	0.91	0	8	0	0		0	n		n	
139	Kerry Bay	07-Jun-10	Sweep	Beach	590		good	0	0	18	7	25	0.5				yellowish - estuarine trout?
140	Kerry Bay	07-Jun-10	Sweep	Beach	420	608	0.82	0	11	32	14	57	0				adipose already clipped
141	Kerry Bay	07-Jun-10	Sweep	Beach	305	252	0.89	0	6	17	2	25	0				adipose already clipped
142	Kerry Bay	07-Jun-10	Sweep	Beach	270	195	0.99	0	5	20	6	31	1				
143	Kerry Bay	07-Jun-10	Sweep	Beach	375	538	1.02	0	12	14	6	32	0				
144	Kerry Bay	07-Jun-10	Sweep	Beach	315	301	0.96	0	16	15	8	39	0				
145	Kerry Bay	07-Jun-10	Sweep	Beach	345	283	0.69	0	14	8	3	25	0			y	hole through fish; died
146	Kerry Bay	07-Jun-10	Sweep	Beach	365	540	1.11	0	12	22	5	39	1.5				
147	Kerry Bay	07-Jun-10	Sweep	Beach	325	327	0.95	0	8	12	1	21	0				
148	Kerry Bay	07-Jun-10	Sweep	Beach	330	398	1.11	0	22	14	8	44	0				
149	Boor Bay	15-Jun-10	Sweep	Beach	169	45	0.93	0	0	0	0	0	0				
150	Boor Bay	15-Jun-10	Sweep	Beach	209	82	0.90	0	1	0	0	1	0				
151	Boor Bay	15-Jun-10	Sweep	Beach	177	55	0.99	0	0	0	0	0	0				
152	Boor Bay	15-Jun-10	Sweep	Beach	152	35	1.00	0	0	0	0	0	0			y	
153	Boor Bay	15-Jun-10	Sweep	Beach	200	78	0.98	0	0	1	0	1	0				
154	Boor Bay	15-Jun-10	Sweep	Beach	183	72	1.17	0	0	1	0	1	0				
155	Boor Bay	15-Jun-10	Sweep	Beach	174	60	1.14	0	0	0	0	0	0				
156	Boor Bay	15-Jun-10	Sweep	Beach	150	33	0.98	0	0	1	0	1	0			y	
157	Boor Bay	15-Jun-10	Sweep	Beach	190	76	1.11	0	4	13	0	17	0				
158	Boor Bay	15-Jun-10	Sweep	Beach	155	38	1.02	0	0	1	0	0	0				
159	Boor Bay	15-Jun-10	Sweep	Beach	167	44	0.94	0	0	0	0	0	0				
160	Boor Bay	15-Jun-10	Sweep	Beach	142	31	1.08	0	0	0	0	0	0				

161	Boor Bay	15-Jun-10	Sweep	Beach	152	37	1.05	0	0	0	0	0	0				
162	Boor Bay	15-Jun-10	Sweep	Beach	153	33	0.92	0	0	0	0	0	0				
163	Boor Bay	15-Jun-10	Sweep	Beach	142	25	0.87	0	0	0	0	0	0				
164	River Carron	16-Jun-10	Sweep	Estuary	390	550	0.93	0	0	0	0	0	0				
165	River Carron	16-Jun-10	Sweep	Estuary	323	285	0.85	0	6	0	0	6	0			old	
166	River Carron	16-Jun-10	Sweep	Estuary	313	252	0.82	0	8	2	0	10	0				
167	River Carron	16-Jun-10	Sweep	Estuary	300	275	1.02	0	7	3	0	10	0				
168	River Carron	16-Jun-10	Sweep	Estuary	291	245	0.99	0	24	38	3	65	0				
169	River Carron	16-Jun-10	Sweep	Estuary	337	355	0.93	0	15	6	0	21	0				
170	River Carron	16-Jun-10	Sweep	Estuary	125			0	0	0	0	0	0				
171	River Carron	16-Jun-10	Sweep	Estuary	142			0	0	0	0	0	0				
172	River Carron	16-Jun-10	Sweep	Estuary	293	228	0.91	0	0	0	0	0	0				
173	River Carron	16-Jun-10	Sweep	Estuary	190	67	0.98	0	18	25	0	43	0				
174	River Carron	16-Jun-10	Sweep	Estuary	258	169	0.98	0	0	0	2	2	0				
175	River Carron	16-Jun-10	Sweep	Estuary	262	177	0.98	0	3	0	0	3	0				
176	River Carron	16-Jun-10	Sweep	Estuary	341	347	0.88	0	6	5	0	11	0				
177	River Carron	16-Jun-10	Sweep	Estuary	318	262	0.81	0	0	2	0	2	0				
178	River Carron	16-Jun-10	Sweep	Estuary	276	200	0.95	0	0	4	0	4	0				
179	River Carron	16-Jun-10	Sweep	Estuary	270	186	0.94	0	24	11	0	35	0				
180	River Carron	16-Jun-10	Sweep	Estuary	331	318	0.88	0	4	9	0	13	0				photo diagonal
181	River Carron	16-Jun-10	Sweep	Estuary	295	228	0.89	0	6	0	0	6	0				
182	River Carron	16-Jun-10	Sweep	Estuary	302	231	0.84	0	0	5	0	5	0				
183	River Carron	16-Jun-10	Sweep	Estuary	245	123	0.84	0	0	0	0	0	0				photo - bird damage
184	River Carron	16-Jun-10	Sweep	Estuary	350	390	0.91	0	0	4	0	4	0				photo diagonal
185	River Carron	16-Jun-10	Sweep	Estuary	118			0	0	0	0	0	0				photo inc. two fish below
186	River Carron	16-Jun-10	Sweep	Estuary	112			0	0	2	2	4	0				
187	River Carron	16-Jun-10	Sweep	Estuary	123			0	0	0	0	0	0				
188	River Carron	16-Jun-10	Sweep	Estuary	113			0	0	0	0	0	0				\
189	River Carron	16-Jun-10	Sweep	Estuary	135			0	0	0	0	0	0				photo
190	River Carron	16-Jun-10	Sweep	Estuary	143			0	0	0	0	0	0				\
191	River Carron	16-Jun-10	Sweep	Estuary	122			0	0	0	0	0	0				\
192	River Carron	16-Jun-10	Sweep	Estuary	108			0	0	2	0	2	0				
193	River Carron	16-Jun-10	Sweep	Estuary	135			0	0	0	0	0	0				
194	River Carron	16-Jun-10	Sweep	Estuary	103			0	0	1	0	1	0				
195	River Carron	16-Jun-10	Sweep	Estuary	374	534	1.02		0	2	0	2	0				photo on measuring board
196	River Carron	16-Jun-10	Sweep	Estuary	435	848	1.03		0	3	0	3	0			old avian	photo with Karen
197	Kerry Bay	22-Jun-10	Sweep	Beach	175	68	1.27	0	0	2	0	2	0				cryptocotal infection
198	Dundonnell	22-Jun-10	Fyke	Estuary	300		0.00		0	0	0	0			lots		
199	Dundonnell	23-Jun-10	Fyke	Estuary	200	80	1.00		30	2	0	32	1.5			N	
200	Dundonnell	23-Jun-10	Fyke	Estuary	207	92	1.04		20+	5	0	26	1	Y		N	

201	Dundonnell	23-Jun-10	Fyke	Estuary	300+				15	3	0	18	1.5			N	Plump. Too big to weigh.
202	Boor Bay	24-Jun-10	Sweep	Beach	152	42	1.20		1	2	0	3	0	y		Y	'skinny'' (scales wobbly?)
203	Boor Bay	24-Jun-10	Sweep	Beach	161	48	1.15		0	3	0	3	0	y			
204	Boor Bay	24-Jun-10	Sweep	Beach	165	50	1.11		0	1	0	1	0	y			
205	Dundonnell	24-Jun-10	Fyke	Estuary	290	250	1.03		0	0	0	0	0	[Y]		N	Grazing along back
206	Charleston Bay	29-Jun-10	Sweep	Estuary	181	64	1.08	0	0	0	0	0	0	n			
207	Charleston Bay	29-Jun-10	Sweep	Estuary	147	26	0.82	1	2	0	1	3	0	n			
208	Charleston Bay	29-Jun-10	Sweep	Estuary	406	592	0.88	0	1	5	8	14	0.5	n			
209	Dundonnell	29-Jun-10	Fyke	Estuary	160	42	1.03					55	1	Y			mobiles and attacheds
210	Gruinard River	01-Jul-10	Rod	River	209				20	26	0	46	0				dead; minimum lice estimate.
211	Gruinard River	01-Jul-10	Rod	River	200				15	12	0	27	0				dead; minimum lice estimate.
212	Dundonnell	1-Jul-10	Fyke	Estuary	147	36	1.13					24	1.5	Y			
213	Dundonnell	1-Jul-10	Fyke	Estuary	155	40	1.07					42	1	Y			
214	Dundonnell	1-Jul-10	Fyke	Estuary	162	48	1.13					37	1	Y			
215	Dundonnell	1-Jul-10	Fyke	Estuary	170	48	0.98					40	1	Y			
216	Dundonnell	1-Jul-10	Fyke	Estuary	180	64	1.10					22	1	Y			
217	Dundonnell	1-Jul-10	Fyke	Estuary	182	50	0.83					62	1.5	Y			
218	Dundonnell	1-Jul-10	Fyke	Estuary	185	69	1.09					20	1	Y			
219	Dundonnell	1-Jul-10	Fyke	Estuary	185	74	1.17					43	2	Y			
220	Dundonnell	1-Jul-10	Fyke	Estuary	185	68	1.07					45	1	Y			
221	Dundonnell	1-Jul-10	Fyke	Estuary	190	86	1.25					28	1	Y		Y	
222	Dundonnell	1-Jul-10	Fyke	Estuary	200	86	1.08					33	1	Y			
223	Dundonnell	2-Jul-10	Fyke	Estuary	143	2	0.07					2	0	N		N	
224	Kinlochhourn	05-Jul-10	Rod	Estuary	209	104	1.14	0	1	2	1	4	0				
225	Kinlochhourn	05-Jul-10	Rod	Estuary	232	139	1.11	0	9	10	0	19	1	yes			20+ lice spots: lice off
226	Kinlochhourn	05-Jul-10	Rod	Estuary	170	55	1.12	0	23	1	0	24	1				
227	Kinlochhourn	05-Jul-10	Rod	Estuary	172	50	0.98	0	0	4	4	6	0				scales a bit wobbly
228	Boor Bay	15-Jul-10	Sweep	Beach	184	69	1.11	0	0	8	1	9					
229	Boor Bay	15-Jul-10	Sweep	Beach	201	95	1.17	0	5	2	0	7	0.5				
230	Boor Bay	15-Jul-10	Sweep	Beach	136	22	0.87	0	1	0	0	1			yes		cryptocotyl infection
231	Boor Bay	15-Jul-10	Sweep	Beach	155	43	1.15	0	0	2	0	2					
232	River Ewe	16-Jul-10	Rod	River	311	331	1.10	0	0	0	0	0	0	y			lice scarred (minimal)
233	River Ewe	16-Jul-10	Rod	River	430	825	1.04	0	0	1	0	1	1.5			y	dead; Lots of scale damage
234	Kerry Bay	22-Jul-10	Sweep	Beach	318	306	0.95	0	13	21	3	37	1		severe		heavy cryptocotyl infection
235	Kerry Bay	22-Jul-10	Sweep	Beach	370	506	1.00	0	1	10	5	16	1				
236	Kerry Bay	22-Jul-10	Sweep	Beach	174	60	1.14	0	5	3	0	8	0		yes		cryptocotyl
237	Charleston Bay	27-Jul-10	Sweep	Estuary	307	300	1.04		2	9	1	12	0	0			
238	Charleston Bay	27-Jul-10	Sweep	Estuary	393	596	0.98		7	8	3	18	0.5				lice damage underside
239	Charleston Bay	27-Jul-10	Sweep	Estuary	414	718	1.01		7	3	4	14	0.5				no scale sample
240	Inverasdale	03-Aug-10	Sweep	Beach	271	200	1.00	0	4	0	0	4	0				

241	Inverasdale	03-Aug-10	Sweep	Beach	351	572	1.32	3	21	30	16	67	1.5				
242	River Carron	10-Aug-10	Sweep	Estuary	221	125	1.16	0	0	1	0	1					lean
243	River Carron	10-Aug-10	Sweep	Estuary	163	50	1.15	0	0	0	0	0					lean
244	River Carron	10-Aug-10	Sweep	Estuary	236	90	0.68	0	3	1	0	4	1				
245	River Carron	10-Aug-10	Sweep	Estuary	225	121	1.06	0	37	13	0	50					
246	River Carron	10-Aug-10	Sweep	Estuary	197	76	0.99	0	0	0	0	0					short dorsal fin
247	River Carron	10-Aug-10	Sweep	Estuary	213	42	0.43	0	3	0	0	3					
248	River Carron	10-Aug-10	Sweep	Estuary	206	45	0.51	0	0	0	0	0	1				thin
249	River Carron	10-Aug-10	Sweep	Estuary	109	63	4.86	1	0	0	0	0					length uncertain may be 189mm
250	River Carron	10-Aug-10	Sweep	Estuary	137	11	0.43	0	0	0	0	0					weight uncertain
251	River Carron	10-Aug-10	Sweep	Estuary	149	22	0.67	0	0	0	0	0					
252	River Carron	10-Aug-10	Sweep	Estuary	131	17	0.76	0	0	0	0	0					
253	River Carron	10-Aug-10	Sweep	Estuary	185	28	0.44	0	0	0	0	0					thin
254	River Carron	10-Aug-10	Sweep	Estuary	129	34	1.58	0	0	0	0	0					pred damage on tail
255	River Carron	10-Aug-10	Sweep	Estuary	203	57	0.68	0	1	0	0	1					
256	River Carron	10-Aug-10	Sweep	Estuary	183	27	0.44	0	0	0	0	0	0.2				
257	River Carron	10-Aug-10	Sweep	Estuary	141	12	0.43	0	0	0	0	0					
258	River Carron	10-Aug-10	Sweep	Estuary	403	562	0.86	0	1	3	0	4					
259	River Carron	10-Aug-10	Sweep	Estuary	128	10	0.48	0	0	0	0	0					
260	River Carron	10-Aug-10	Sweep	Estuary	207	35	0.39	0	0	0	0	0					
261	River Carron	10-Aug-10	Sweep	Estuary	192	72	1.02	0	0	0	0	0	0.5				
262	River Carron	10-Aug-10	Sweep	Estuary	208	105	1.17	0	0	1	0	0					
263	River Carron	10-Aug-10	Sweep	Estuary	248	112	0.73	0	0	0	0	0					rounded tail 15 lice spots
264	River Carron	10-Aug-10	Sweep	Estuary	158	35	0.89	0	0	0	0	0					
265	River Carron	10-Aug-10	Sweep	Estuary	185	63	1.00	0	0	0	0	0					predator damage (bird)
266	River Carron	10-Aug-10	Sweep	Estuary	140	10	0.36	0	0	0	0	0					
267	River Carron	10-Aug-10	Sweep	Estuary	158			0	0	0	0	0					
268	River Carron	10-Aug-10	Sweep	Estuary	147			0	0	0	0	0					
269	River Carron	10-Aug-10	Sweep	Estuary	183	35	0.57	0	0	0	0	0					
270	River Carron	10-Aug-10	Sweep	Estuary	380	350	0.64	0	0	0	0	0	0.5				thin
271	River Carron	10-Aug-10	Sweep	Estuary	283	128	0.56	0	0	0	0	0	1				
272	River Carron	10-Aug-10	Sweep	Estuary	136			0	0	0	0	0					
273	River Carron	10-Aug-10	Sweep	Estuary	318	165	0.51	0	0	0	0	0	1				thin
274	River Carron	10-Aug-10	Sweep	Estuary	217	64	0.63	0	0	2	0	2	1.5				
275	River Carron	10-Aug-10	Sweep	Estuary	350	310	0.72	0	0	1	0	1	0.5				
276	River Carron	10-Aug-10	Sweep	Estuary	188	40	0.60	0	0	0	0	0					
277	River Carron	10-Aug-10	Sweep	Estuary	305	206	0.73	0	0	3	0	3					
278	River Carron	10-Aug-10	Sweep	Estuary	182	46	0.76	0	0	0	0	0					
279	River Carron	10-Aug-10	Sweep	Estuary	234	144	1.12	0	0	6	1	7	1.5				
280	River Carron	10-Aug-10	Sweep	Estuary	175			0	0	0	0	0					

281	River Carron	10-Aug-10	Sweep	Estuary	198	112	1.44	0	0	0	0	0					
282	River Carron	10-Aug-10	Sweep	Estuary	194	103	1.41	0	0	0	0	0					
283	River Carron	10-Aug-10	Sweep	Estuary	222	99	0.90	0	0	0	0	0					yellow trout
284	River Carron	10-Aug-10	Sweep	Estuary	153	45	1.26	0	0	0	0	0					
285	River Carron	10-Aug-10	Sweep	Estuary	182	77	1.28	0	0	0	0	0					
286	River Carron	10-Aug-10	Sweep	Estuary	164	46	1.04	0	0	0	0	0					
287	River Carron	10-Aug-10	Sweep	Estuary	206	111	1.27	0	0	0	1	0					odd louse, predator damage
288	River Carron	10-Aug-10	Sweep	Estuary	200	92	1.15	0	0	0	0	0					thin stockie
289	River Carron	10-Aug-10	Sweep	Estuary	192	96	1.36	0	0	0	1	0					
290	River Carron	10-Aug-10	Sweep	Estuary	210	115	1.24	0	0	0	0	0					
291	River Carron	10-Aug-10	Sweep	Estuary	202	84	1.02	0	0	0	0	0					
292	River Carron	10-Aug-10	Sweep	Estuary	178	77	1.37	0	0	0	0	0					
293	River Carron	10-Aug-10	Sweep	Estuary	175	40	0.75	0	0	0	0	0	0.2				
294	River Carron	10-Aug-10	Sweep	Estuary	182	39	0.65	0	0	0	0	0					odd louse
295	River Carron	10-Aug-10	Sweep	Estuary	176	38	0.70	0	0	0	0	0					
296	River Carron	10-Aug-10	Sweep	Estuary	195	64	0.86	0	0	0	0	0					
297	River Carron	10-Aug-10	Sweep	Estuary	176			0	0	0	0	0					
298	River Carron	10-Aug-10	Sweep	Estuary	127			0	0	0	0	0					
299	River Carron	10-Aug-10	Sweep	Estuary	167			0	0	0	0	0					
300	River Carron	10-Aug-10	Sweep	Estuary	185	96	1.52	0	0	0	0	0					
301	River Carron	10-Aug-10	Sweep	Estuary	142			0	0	0	0	0					
302	Boor Bay	12-Aug-10	Sweep	Beach	187	77	1.18	0	5	2	1	8	0	Y		N	tatty fins
303	Boor Bay	12-Aug-10	Sweep	Beach	193	83	1.15	0	4	6	1	11	0				
304	Boor Bay	12-Aug-10	Sweep	Beach	165	58	1.29	0	14	0	0	14	0				
305	Boor Bay	12-Aug-10	Sweep	Beach	187	88	1.35	0	11	10	2	23	0				
306	Boor Bay	12-Aug-10	Sweep	Beach	171	67	1.34	0	18	6	0	24	0				
307	Charleston Bay	27-Aug-10	Sweep	Estuary	366	531	1.08	0	2	4	4	10	0				
308	Charleston Bay	27-Aug-10	Sweep	Estuary	452	995	1.08	0	0	4	0	4	0				
309	Charleston Bay	27-Aug-10	Sweep	Estuary	480	1068	0.97	0	1	6	4	11	1				
310	Charleston Bay	27-Aug-10	Sweep	Estuary	359	505	1.09	0	13	20	9	42	1.5	y			
311	Charleston Bay	27-Aug-10	Sweep	Estuary	435	818	0.99	0	2	7	5	14	0.5	y			lump behind dorsal fin
312	Charleston Bay	27-Aug-10	Sweep	Estuary	378	557	1.03	0	1	5	0	6	1				fin
313	Charleston Bay	27-Aug-10	Sweep	Estuary	340	415	1.06	0	21	24	1	46	1.5	y		2	fin
314	Charleston Bay	27-Aug-10	Sweep	Estuary	313	335	1.09	0	0	7	1	8	0			3	
315	Charleston Bay	27-Aug-10	Sweep	Estuary	283	257	1.13	0	0	0	1	1	0			1	
316	Charleston Bay	27-Aug-10	Sweep	Estuary	257	179	1.05	0	5	3	6	14	0.5	y			tail damage
317	Boor Bay	13-Sep-10	Sweep	Beach	197	95	1.24	0	2	4	0	6	0.5				
318	Boor Bay	13-Sep-10	Sweep	Beach	265	215	1.16	0	0	6	0	6	1				
319	Flowerdale	23-Sep-10	Sweep	Estuary	368	478	0.96	0	1	0	7	8	0.2		20 spots/cm^2	y	flank and tail damaged
320	Flowerdale	23-Sep-10	Sweep	Estuary	388	565	0.97	0	0	4	2	6	0		50 spots/cm^2	n	

321	Flowerdale	23-Sep-10	Sweep	Estuary	421	750	1.01	0	8	9	10	27	1.5			y	seal damage
322	Flowerdale	23-Sep-10	Sweep	Estuary	434	845	1.03	0	2	12	13	27	1		10 spots/cm^2	y	adipose clipped
323	Flowerdale	23-Sep-10	Sweep	Estuary	397	645	1.03	0	0	6	0	6	2		1 spots/cm^2	y	dorsal fin predator damage
324	Flowerdale	23-Sep-10	Sweep	Estuary	314	333	1.08	0	0	1	2	3	0		50 spots/cm^2	y	
325	Charleston Bay	19-Oct-10	Sweep	Estuary	379	535	0.98	0	0	0	0	0	0.5	n	n		Fin clipped
326	Charleston Bay	19-Oct-10	Sweep	Estuary	382	540	0.97	0	0	0	1	1	0.2	n	y		Fin clipped
327	Charleston Bay	19-Oct-10	Sweep	Estuary	353	495	1.13	0	0	0	0	0	0	n	y		no scale sample
328	Kery River mouth	21-Feb-11	Sweep	Estuary	381	471	0.85	3	10	1	14	0	3	y		n	tatty fins
329	River Carron	22-Feb-11	Sweep	Estuary	393			0	0	0	0	0	0	n	5 spots/cm^2	Y	
330	River Carron	22-Feb-11	Sweep	Estuary	407			0	0	0	0	0	0	n			
331	River Carron	22-Feb-11	Sweep	Estuary	387			0	0	0	0	0	0	n			
332	River Carron	22-Feb-11	Sweep	Estuary	387			0	0	0	0	0	0	n			
333	River Carron	22-Feb-11	Sweep	Estuary	384			0	0	0	0	0	0	n			
334	River Carron	22-Feb-11	Sweep	Estuary	345			0	0	0	0	0	0	n			tail fin damage
335	Charleston Bay	18-Mar-11	Sweep	Estuary	333	290	0.79	0	4	1	0	5	0.5	n	10 spots/cm^2	n	
336	Charleston Bay	18-Mar-11	Sweep	Estuary	355	380	0.85	0	3	5	3	11	0.5	n	0	y	beak, deformed right pectoral fin
337	Charleston Bay	18-Mar-11	Sweep	Estuary	350	416	0.97	0	2	4	0	6	0	n	0	Y	
338	Charleston Bay	18-Mar-11	Sweep	Estuary	306	231	0.81	0	3	12	1	16	0.5		5 spots/cm^2		
339	Charleston Bay	18-Mar-11	Sweep	Estuary	296	206	0.79	0	2	3	2	7	0.5		30 spots/cm^2		
340	Charleston Bay	18-Mar-11	Sweep	Estuary	318	278	0.86	0	0	2	1	3	0.2		50 spots/cm^2		
341	Charleston Bay	18-Mar-11	Sweep	Estuary	279	152	0.70	0	9	15	0	24	0.5		10 spots/cm^2	y	beak tail and flank
342	Charleston Bay	18-Mar-11	Sweep	Estuary	331	196	0.54	0	6	13	14	33	1.5		0		ulceration on head
343	Charleston Bay	18-Mar-11	Sweep	Estuary	251	105	0.66	0	1	14	8	23	0.5		0		
344	Charleston Bay	18-Mar-11	Sweep	Estuary	295	145	0.56	0	2	1	0	3	0		0	y	beak slightly deformed tail
345	Charleston Bay	18-Mar-11	Sweep	Estuary	324	178	0.52	0	13	54	2	69	1		0	y	heron mark
346	Charleston Bay	18-Mar-11	Sweep	Estuary	288	119	0.50	0	0	2	3	5	0.2		1 spots/cm^2	y	beak on flank
347	Charleston Bay	18-Mar-11	Sweep	Estuary	337	180	0.47	0	6	2	0	8	0.2		0		possible fin clip
348	Charleston Bay	18-Mar-11	Sweep	Estuary	424	380	0.50	0	0	5	1	6	0.5		0		