



WSA Water Temperature Monitoring

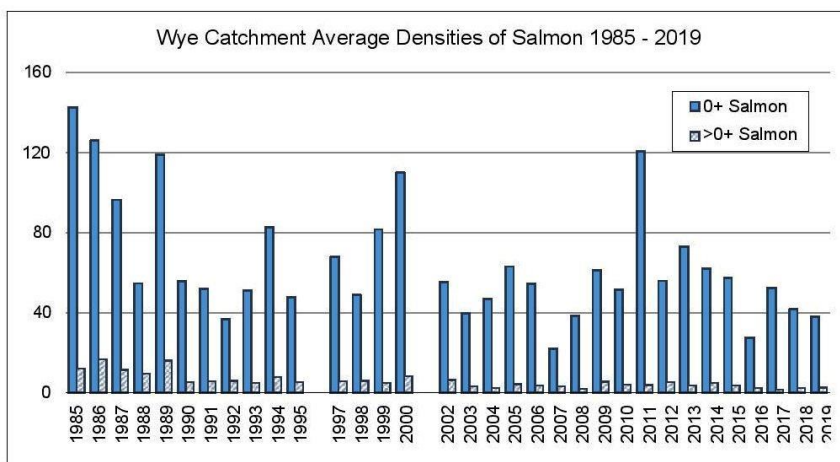
Update 10 Dec 2020

It is a while now since we have updated you on our long-term water temperature monitoring project. Overall aim of the project is to monitor water temperatures in key spawning streams over a period of 5 years to gain a better understanding of the effect of stream water temperatures on the spawning success and survival of juvenile salmon.

In 2016 Environment Agency (EA)/National Resources Wales (NRW) completed the England/Wales salmonid fry and parr survey programme. The data looked at trends in juvenile salmon and trout densities. Monitoring revealed particularly dramatic reduction in juvenile salmonids. Theories to explain this apparent disastrous survival include the particularly warm winter temperatures of 2015/16 affecting reproductive performance and or survival of eggs coupled with the extreme flooding in early 2016.

Winter temperatures occasionally increasing above 10°C would not be expected to cause substantial mortality unless this was prolonged during the initial phase after fertilisation. However, we understood long-term

increases in average river water temperature may affect the process in which eggs convert to fry. The pattern of increasing winter temperatures over the past couple of decades is suggested as contributing to the apparent declines in juvenile salmonid abundance over this period.



Initially temperature data recorders were set up by WSA volunteer teams in 11 of the key indicator locations used by NRW in long term monitoring of juvenile numbers, gathering stream water and local air temperatures. The results will capture a snapshot of salmon spawning sites thermal conditions during key periods within the spawning cycle of salmonids. This will be used to help NRW/EA develop an effective management plan for salmon and assist in assessing the impact and deepening our understanding the effects of in-stream temperature regimes on spawning success of salmonids.

Data recorders were placed in the stream at each agreed location taking and recording water temperatures each hour. Care was taken to ensure recorders would remain submerged under all water conditions and be easily recovered for sampling. Air temperature recorders were also attached at same locations. A document has been compiled summarising locations, dates of collection, etc. Data are downloaded from each recorder each year, stored and available on request.

Our volunteers have made valiant efforts to ensure recorders are located, retrieved, and serviced each year to maintain the flow of data. Sometimes failing as floods, debris, gravel movements and on at least one occasion a very difficult landowner posed risks, We have lost a few (data recorders that is) and at least one remains, still recording but trapped under debris that will need heavy lifting gear to retrieve as soon as water and lockdown conditions allow.

WSA began the project in September 2017 and we now have 3 full years data for those 11 sites.

Following discussions with NRW and Cardiff University School of Biosciences, Water and Rivers Research Institute a PhD Candidate was offered for further water temperature explorations, allowing different spatial characteristics, e.g. altitudes, tree covering, land-use and hydro morphology which describes the form and functioning of surface waters of rivers, including width, depth, variability and connectivity to be studied. As a result, we agreed to increase the temperature recording locations to include a number in the deeper pools and riffles of the main river. We have now gathered or are gathering data from 36 sites with another at Fawley to be established as soon as possible. It is particularly important that the sensors that are already established in the main river, and tributaries and streams along with new additions are representative of the overall reach conditions and are protected from dewatering, drought and direct sunlight.

The additional temperature exploration data will look to capture small-scale variability in temperatures associated with the source water characteristics of the rivers/streams. Additionally, assessing riffles, pools and backwater habitats, as well as beneath undercut banks will allow identification of fluctuations in temperatures associated with these in-water niche habitats, that often allow shelter for fish and may offer protection from high temperatures.

The recorders, originally planned for just the spawning periods, are now left in position over the course of at least a year, so seasonal fluctuations can be captured.

An example of our collected data is attached. The example graph, of the Dernol, a usually productive juvenile stream, shows data for 3.5 years. Whilst not exhaustive in its analysis, this graph suggests, temperatures recorded on the Dernol during the 2017 to 2020 period would not be expected to cause substantial mortality. However, a more exhaustive and thorough study reporting of trends at the end of the project may well reveal more.

Several other similar networks exist. The Loughborough University Temperature Network (LUTEN) provides detailed measurements of air and water temperature for the Derbyshire rivers Dove and Manifold. Loughborough University propose expanding to a second network in Leicestershire and Salmon and Trout Conservation UK (S&TC-UK) are considering temperature sensors in a number of the southern chalk streams. We would hope to be able to share this information online once available.

More in our next update in the spring.

Happy Christmas to all our members.

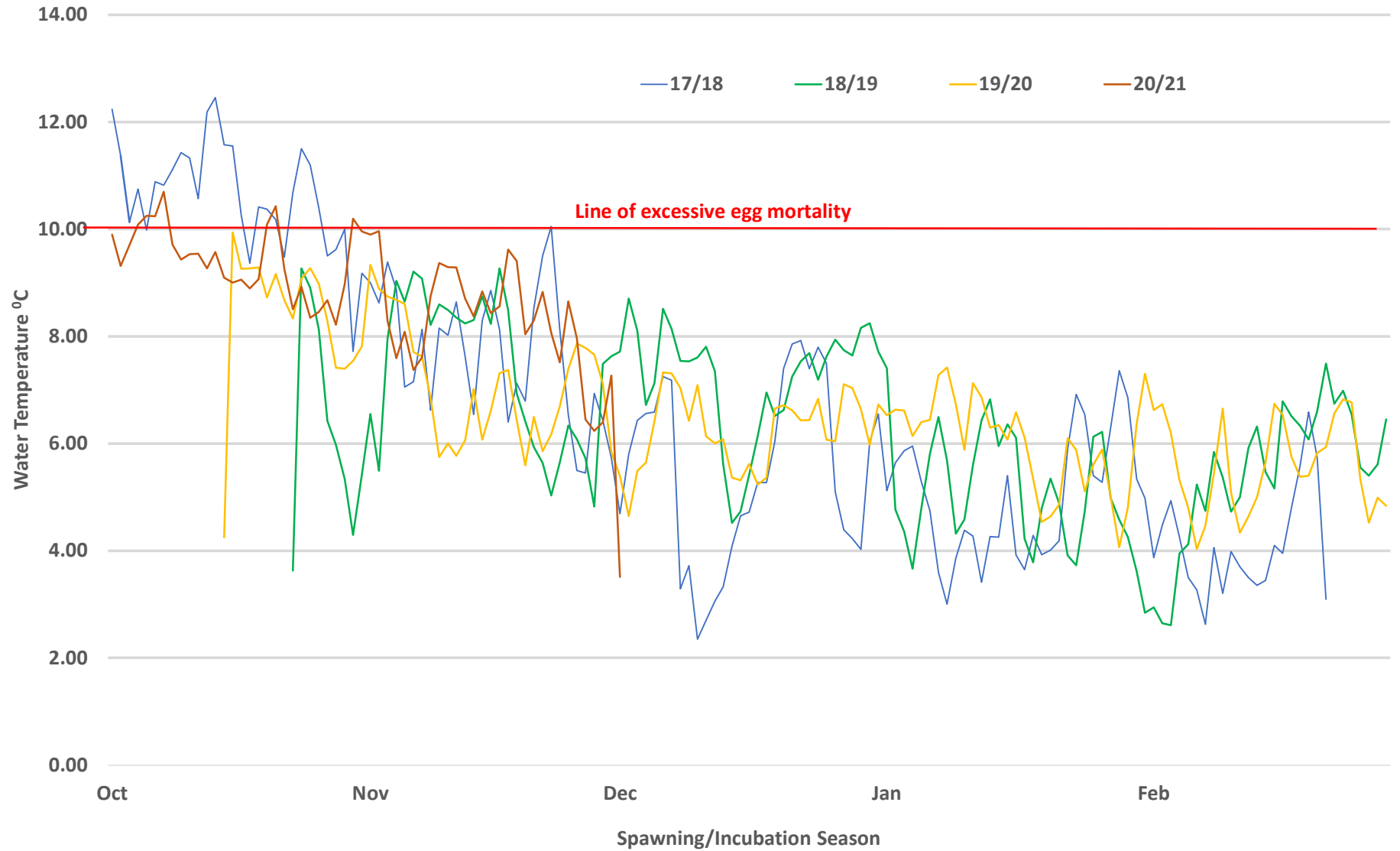
Keep safe

Stuart Smith
WSA

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Water Temperatures River Dernol 2017 to 2020

Daily Averages during Spawning Season



WSA Temperature Modelling Database

NRW Site Ref. No.	Serviced and Reset 2020	Volunteer	River	Type	Ht Above Sea Level (M)	Data Start Date	Data Finish Date	Site Description							File Name	Locn. Description	
								Launch Water Depth (M)	River Height Station	Station Height at Launch	Photos Y/N	Map Y/N	Landscape	Lighting			Land Use
W003	Yes	SRS	Llanwrthyl Brook1	River Bed	178.0	10/09/17	Running	0.300	Ddol Farm	0.724	Y	Y	Rough Pasture	Unshaded	Arable	W003 Llanwrthyl Brook1water.xlsx	Talwrnmaenog Farm, Llanwrthyl, LD1 6NT Thomas 01597 810325
W003	No	SRS	Llanwrthyl Brook2	Air	180.0	10/09/17	09/09/20	n/a	Ddol Farm	n/a	Y	Y	Rough Pasture	Shaded	Arable	W003 Llanwrthyl Brook2air.xlsx	Talwrnmaenog Farm, Llanwrthyl, LD1 6NT Thomas 01597 810325
W001	No	PC	Dernol1 (Ref)	River Bed	301.0	21/09/17	Running	0.400	Ddol Farm	0.751	Y	N	Rough Pasture	Shaded	Cattle	W001 Dernol1.xlsx	Tan-yr-allt Youth Hostel
W001	No	PC	Dernol2	Air	302.0	21/09/17	Running	n/a	Ddol Farm	n/a	Y	N	Rough Pasture	Shaded	Cattle	W001 Dernol2.xlsx	Tan-yr-allt Youth Hostel
W002	Yes	PC	Marteg1 (Ref)	River Bed	242.0	22/09/17	Running	0.450	Ddol Farm	0.617	Y	N	Woodland	Unshaded	n/a	W002 Marteg1.xlsx	Nature Reserve
W002	No	PC	Marteg2	Air	243.0	22/09/17	Running	n/a	Ddol Farm	n/a	Y	N	Woodland	Unshaded	n/a	W002 Marteg2.xlsx	Nature Reserve
W002	No	PC	Marteg3	Interstitial	242.0	27/09/19	Lost	0.450	Ddol Farm	0.588	Y	N	Woodland	n/a	n/a	Logger lost in floods	Nature Reserve
W002	No	PC	Marteg4	River Bed	n/a	n/a	n/a	n/a	Ddol Farm	n/a	N	N	Woodland	n/a	n/a	No suitable deep water found	Nature Reserve
W004	Yes	RA/LB	Ithon1 (Ref)	River Bed	232.0	10/09/17	Running	0.150	Llanddewi	0.150	Y	N	Pasture	Unshaded	Cattle	W004 Ithon1.xlsx	Dol-yr-Dre Farm
W004	No	RA/LB	Ithon3	Interstitial	232.0	31/10/19	12/09/20	0.200	Llanddewi	0.321	Y	N	Pasture	Unshaded	Cattle	W004 Ithon3.xlsx	Dol-yr-Dre Farm
W004	No	RA/LB	Ithon2	Air	234.0	10/09/17	12/09/20	n/a	Llanddewi	n/a	Y	N	Pasture	Unshaded	Cattle	W004 Ithon2.xlsx	Dol-yr-Dre Farm
W004	Yes	RA/LB	Ithon4 (upstream)	River Bed	232.0	12/09/20	Running	1.200	Llanddewi	0.150	N	N	Pasture	Shaded	Cattle	Pending data download 2021	Dol-yr-Dre Farm. Amongst trees, very low flow
W004	Yes	RA/LB	Ithon5 (downstream)	River Bed	232.0	12/09/20	Running	1.300	Llanddewi	0.150	N	N	Pasture	Shaded	Cattle	Pending data download 2021	Dol-yr-Dre Farm. High flow, shade during pm
n/a	Yes	SRS	Wye (Belmont)1	River Bed	53.0	17/08/19	Running	1.000	Hereford	0.899	Y	N	Arable/Housing	Unshaded	Houses	Wxxx.Belmont1.xlsx	Rear of 11 Deerhurst Drive, Hereford, United Kingdom, HR2 7XX
n/a	Yes	SRS	Wye (Llanthomas)1	River Bed	80.0	27/03/19	Running	0.500	Hay	0.518	Y	N	Mixed Wood/Pasture	Shaded	Arable	na Llanthomas1.xlsx	Llanthomas Fishery, Llowes, Powys
n/a	Yes	SRS	Wye (Llanthomas)2	River Bed	80.0	01/09/20	Running	1.200	Hay	0.525	Y	N	Mixed Wood/Pasture	Unshaded	Arable	Pending data download 2021	Llanthomas Fishery, Llowes, Powys
n/a	Yes	RA/TM	Wye (Golden Mile)2	River Bed	43.0	24/08/20	Running	2.300	Mordiford	1.140	Y	N	Pasture	Shaded	Arable	Pending data download 2021	Golden Mile Fishery, Ballingham (Walkers patch)
n/a	No	RA/TM	Wye (Golden Mile)1	Interstitial	43.0	18/08/19	Lost	0.150	Mordiford	0/57	N	N	Pasture	Unshaded	Arable	Logger lost in floods	Golden Mile Fishery, Ballingham (bottom of Boat Pool opp bank)
n/a	Yes	RA/TM	Wye (Golden Mile)3	River Bed	43.0	24/08/20	Running	2.500	Mordiford	1.140	Y	N	Pasture	Unshaded	Arable	Pending data download 2021	Golden Mile Fishery, Ballingham (above Sheep hut)
n/a	Yes	RA/TM	Wye (Golden Mile)4	River Bed	43.0	26/07/19	Running	0.150	Mordiford	1.140	N	N	Pasture	Unshaded	Arable	Wxxx.Golden Mile4.xlsx	Golden Mile Fishery, Ballingham (bottom of Boat Pool opp bank)
W011	Yes	TM/ST	Edw1	River Bed	157.0	14/09/17	Running	0.190	Erwood	0.170	N	N	Woodland	Shaded	Sheep	W011 Edw1.xlsx	Above Woodland Cottage Bridge, Llanbadarn-y-garreg
W011	No	TM/ST	Edw2	Air	159.0	15/09/17	18/07/19	n/a	Erwood	n/a	N	N	Woodland	Shaded	Sheep	W011 Edw2.xlsx	Above Woodland Cottage Bridge, Llanbadarn-y-garreg, Lost 2019
W011	Yes	TM/ST	Edw3	River Bed	157.0	15/09/20	Running	0.560	Erwood	0.870	N	N	Woodland	Shaded	Sheep	Pending data download 2021	Deep Pool Above Woodland Cottage Bridge, Llanbadarn-y-garreg
W012	Yes	TM/ST	Sgithwen1 ⁽⁴⁾	River Bed	103.0	15/09/17	Running	0.480	Erwood	0.440	Y	N	Mixed Wood/Pasture	Shaded	n/a	W012 Sgithwen1.xlsx	Gate RH side of Llanstephan Bridge(Trericket Mill side)across field to confluence
W012	Np	TM/ST	Sgithwen2	Air	105.0	15/09/17	15/09/20	n/a	Erwood	n/a	N	N	Mixed Wood/Pasture	Shaded	n/a	W012 Sgithwen2.xlsx	Gate RH side of Llanstephan Bridge(Trericket Mill side)across field to confluence
W009	Yes	TM/ST	Chwefri1	River Bed	128.0	15/09/17	Running	0.240	Builth Wells	1.764	Y	N	Golf Course	Unshaded	n/a	W009 Chwefri1.xlsx	7m down stream of footbrdge, middle of Builth Wells Golf club
W009	No	TM/ST	Chwefri2	Air	130.0	15/09/17	15/09/20	n/a	Builth Wells	n/a	Y	N	Golf Course	Unshaded	n/a	W009 Chwefri2air.xlsx	7m down stream of footbrdge, middle of Builth Wells Golf club
W010	Yes	TM/ST	Duhonw1	River Bed	126.0	15/09/17	Running	0.410	Erwood	0.440	Y	N	Rough Pasture	Shaded	Sheep	W010 Duhonw1.xlsx	Aberduhonw Farm, 20yds downstream A470 bridge LH bank
W010	No	TM/ST	Duhonw2	Air	128.0	15/09/17	13/09/20	n/a	Erwood	n/a	Y	N	Rough Pasture	Shaded	Sheep	W010 Duhonw2.xlsx	Aberduhonw Farm, 20yds downstream A470 bridge LH bank
W005	No	SRS	Clywedog1 ⁽¹⁾	River Bed	193.0	11/11/17	02/02/18	0.240	Llanddewi	0.460	Y	N	Rough Pasture	Shaded	Sheep	W005 Clywedog1water(1).xlsx	10yds upstream of Gwystre Bridge, Greenaway Manor, A44
W005	No	SRS	Clywedog1 ⁽²⁾	River Bed	224.0	22/10/18	27/07/19	0.600	Llanddewi	0.205	Y	N	Rough Pasture	Shaded	n/a	na Clywedog1water(2).xlsx	Crossgares to Abbercymhir Rd 4 m for turning on A483
W005	Yes	RA/LB	Clywedog1 ⁽³⁾	River Bed	213.0	31/09/19	Running	0.280	Llanddewi	0.300	N	Y	PastureWoodland	Shaded	n/a	W005 Clywedog1.xlsx	250m before bridge on Brynlygoed to Henfryn Rd off A483
W005	No	RA/LB	Clywedog2	Air	217.0	11/11/17	04/08/20	n/a	Llanddewi	n/a	N	Y	Pasture	Shaded	n/a	na Clywedog2air.xlsx	250m before bridge on Brynlygoed to Henfryn Rd off A483
W007	No	RA/LB	South Dulas1 ⁽⁵⁾ (Ref)	River Bed	180.0	22/09/17	Running	0.550	Cilmerly	0.655	Y	N	Rough Pasture	Shaded	n/a	W007 south dulas1.xlsx	At road bridge rh side, right bank downstream 0.5m
W007	No	RA/LB	South Dulas2	Air	180.0	21/09/17	12/09/20	n/a	Cilmerly	n/a	Y	N	Mixed Wood/Pasture	Shaded	n/a	W007 south dulas2air.xlsx	At road bridge rh side, right bank downstream 4m in tree
W007	Yes	RA/LB	South Dulas3	River Bed	179.0	12/09/20	Running	1.000	Cilmerly	0.390	N	N	Mixed Wood/Pasture	Shaded	n/a	Pending data download 2021	Downstream of Ref Sensor. Placed against tree end of deep open bend
W008	Yes	RA/LB	Garth Dulas1 (Ref)	River Bed	181.0	21/09/17	Running	0.200	Cilmerly	0.899	Y	N	Rough Pasture	Shaded	Sheep	W008 garth dulas1water.xlsx	A483 gate oppchurch. Over stream up to gate rh side down to river see photos
W008	No	RA/LB	Garth Dulas2	Air	181.0	21/09/17	12/09/20	n/a	Cilmerly	n/a	Y	N	Rough Pasture	Shaded	Sheep	W008 garth dulas2air.xlsx	A483 gate oppchurch. Over stream up to gate rh side down to river see photos
W008	Yes	RA/LB	Garth Dulas3	River Bed	172.0	12/09/20	Running	0.150	Cilmerly	0.390	N	N	Rough Pasture	Shaded	Sheep	Pending data download 2021	Upstream of Ref sensor. Low flow at end of pool. Partial shaded
n/a	N	GG	Fawley	River Bed	tbc	tbc	No	tbc	Mordiford	tbc	N	N	tbc	tbc	tbc	tbc	Installation to take place asap

- Notes!
(1) Original location
(2) Temporary location. Moved due to difficulties with landowner
(3) Final location
(4) On 15/09/2020 Sgithwen water logger was found out of water some 5yds from its location. Assumed moved by large spate on March 20. Data after 24/mar removed as it matched that on air logger
(5) Logger stuck under fallen tree. To be removed asap