

A303 Amesbury to Berwick Down

TR010025

6.3 Environmental Statement Appendices

Appendix 8.12B Fish survey report River Till

APFP Regulation 5(2)(a)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed
Forms and Procedure) Regulations 2009

October 2018



Technical Note

A303 Amesbury to Berwick Down

Subject: River Till Fish and Lamprey Surveys

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1 Introduction

1.1 Overview

1.1.1 Fish surveys (including lamprey ammocoete survey) were undertaken to establish baseline information on the fish populations of a 3km length of the River Till around Winterbourne Stoke. These surveys provide information on species presence and population metrics (density and biomass estimates).

1.1.2 Summary fisheries data is presented in this technical note. The raw catch data and habitat data used in calculating the estimates presented are available on request.

1.1.3 Surveys were undertaken along six 500m reaches as shown in Figure 1-1. Upstream and downstream grid references (NGR) for each survey reach are provided in Table 1-1. For each of the Winterbourne Stoke A303 bypass options (northern and southern) the surveys were contiguous, extending 500m upstream of the proposed crossing location, and for 1 km downstream.

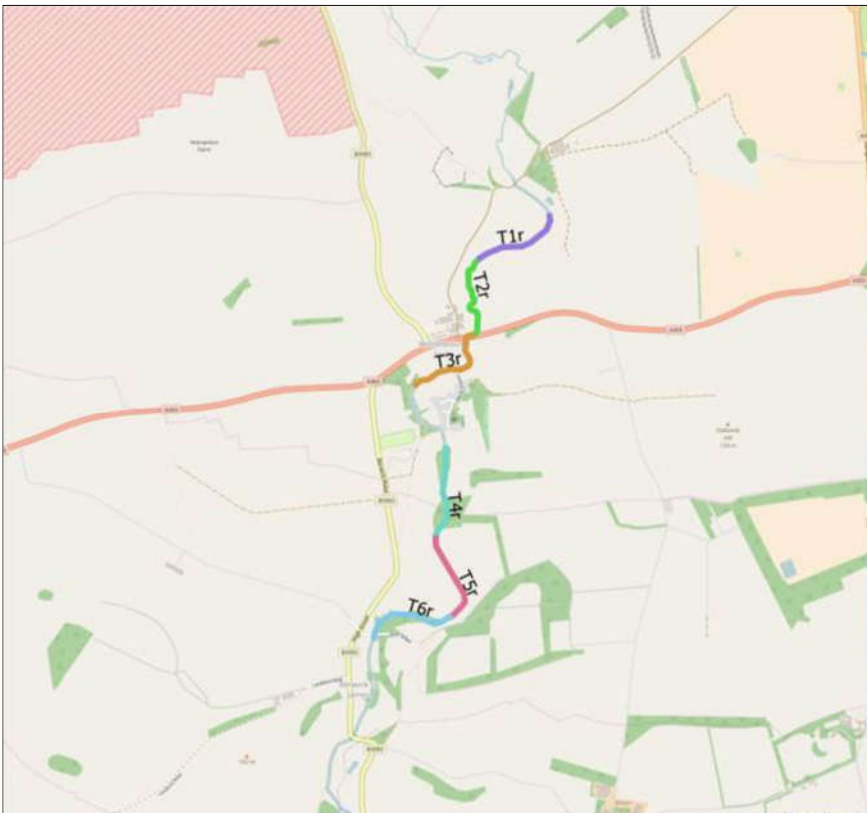


Figure 1-1 River Till fish survey reaches

Table 1-1 Survey reach NGRs and associated bypass option

Reach	Upstream NGR	Downstream NGR	Associated bypass option
T1r	SU 08202 41752	SU 07827 41506	Northern bypass. Proposed crossing at boundary of T1r and T2r.
T2r	SU 07827 41506	SU 07807 41109	
T3r	SU 07807 41109	SU 07518 40865	
T4r	SU 07649 40501	SU 07642 40031	Southern bypass. Proposed crossing at boundary of T4r and T5r.
T5r	SU 07642 40031	SU 07726 39588	
T6r	SU 07726 39588	SU 07272 39518	

2 Methods

2.1 Fish survey method

2.1.1 Fish surveys were undertaken between the 23rd and 24th May 2017 by a specialist fisheries contractor. All surveys were consented by the Environment Agency.

2.1.2 Prior to undertaking the fish survey the proportion of each habitat type present (e.g. riffle, glide, pool) in each 500m reach was determined. This information was used to select the most effective survey method/s to be applied at the reach scale.

2.1.3 Sampling effort within each 500m reach was then apportioned relative to the overall amount of the specific habitat type present so that population metric estimates from the raw catch data could be calculated (after Carle and Strub, 1978¹).

2.1.4 The survey method applied within all reaches was as follows:

- Fully quantitative triple shock electric fishing:
 - Three run catch depletion survey within a known stop netted area.

2.1.5 Fish captured were identified to species, counted and either fork length or total length measured to the nearest mm (depending on species caught). The weight (g) of individual fish were then calculated using fish length/weight conversion data held on the fishbase.org website. Note that length/weight conversion data is not available for smaller species such as stone loach, bullhead and minnow, therefore biomass estimates exclude minor species.

2.1.6 All electric fishing surveys followed standard practice for operators and equipment as developed by the European Standards Committee (CEN, 2001) as detailed in the Environment Agency Code of Practice and Electric Fishing Equipment Annex A and B, Issue II regulations (1998).

¹ Carle, F.L. & Strub, M.R. (1978). A new method for estimating population size from removal data. *Biometrics*, 34, 621-830.

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2.2 Lamprey ammocoete survey method

2.2.1 Lamprey surveys concentrated on the quantification of ammocoete (larval) populations as this approach provides the best and most cost-effective approach in the assessment of recruitment success within the population.

2.2.2 Lamprey ammocoete surveys were undertaken between the 23rd and 24th May 2017 following the LIFE (Harvey & Cowx, 2003²) method which uses electric fishing within a standard 1m square quadrat.

2.2.3 Surveys were carried out in both optimal and sub-optimal habitat (where present) within each 500m reach. Prior to undertaking lamprey ammocoete survey a search was undertaken to quantify the occurrence of optimal and sub-optimal lamprey habitat.

2.2.4 Optimal lamprey ammocoete habitat was defined as:

- Several square metres of stable, fine sediment at least 150mm deep (Potter *et al.*, 1986³; Harvey & Cowx, 2003²);
- Low water velocity (Thomas, 1962⁴; Malmqvist, 1980⁵);
- Shallow water depth (Malmqvist, 1980⁵); and
- Organic detritus (Potter *et al.*, 1986³).
- Presence of shade (Potter *et al.*, 1986³)

2.2.5 Sub-optimal habitat was defined as patchy, shallow sediment interspersed among coarser substrate with comparatively high velocity flow, more typically described as salmonid fry and parr habitat.

2.2.6 Quantitative surveys of optimal and sub-optimal habitat were undertaken by enclosing a 1m² area of habitat within a quadrat (2mm fine mesh netting). Electric fishing for lamprey was then undertaken within the quadrat in such a way as to draw individual lamprey out of the sediment rather than stunning and trapping them in the silt (see APEM 2002⁶, for further details of the procedure).

2.2.7 Lamprey were enumerated, measured (to the nearest mm) and if possible an absolute population estimate calculated using the Carle and Strub (1978¹) depletion methodology.

² Harvey, J.P. & Cowx, I.G. (2003). Monitoring the River, Brook and Sea Lamprey. Conserving Natura 2000 Rivers Monitoring Series No. 5, English Nature, Peterborough, pp. 35.

³ Potter, I.C., Hillard, R.W., Bradley, J.S. & McKay, R.J. (1986). The influence of environmental variables on the density of larval lampreys in different seasons. *Oecologia*, 70, 433-440.

⁴ Thomas, M.L.H.: Observations on ecology of ammocoetes *Petromyzon marinus* L. and *Entosphenus lamottei* (Le Sueur). Thesis, University of Toronto, Canada. (1962)

⁵ Malmqvist, B. (1980). The spawning migration of the brook lamprey, *Lampetra planeri* Bloch, in a South Swedish stream. *Journal of Fish Biology*, 16:1, 105-114.

⁶ APEM (2002). Sampling methodologies for condition assessment within SAC Rivers for adult sea, river and brook lamprey, bullhead and spined loach. Phase IIa Report. LIFE in UK Rivers Project, pp. 38.

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3 Summary results

3.1 Till fish summary data

3.1.1 Summary fisheries data is presented in Table 3-1 for the six, 500m survey reaches, sampled on the River Till. Density and biomass estimates are presented for all species data and for data excluding minor species. The latter is less biased by the abundance of smaller species (e.g. bullhead and three-spined stickleback) and has been used to provide comparative review in Section 4.

3.1.2 It should be noted that survey reaches T1r to T3r (associated with the northern bypass option around Winterbourne stoke) are located within the ephemeral section of the River Till (watercourse tends to dry out in late summer through to late autumn). Reaches T4r to T6r (associated with the southern bypass option) are downstream of the perennial head on the River Till and therefore typically experience flow throughout the hydrological year.

3.1.3 Lamprey data is presented separately in Section 0.

Table 3-1 Fish survey summary data for the River Till survey reaches

Survey stretch ID	T1r	T2r	T3r	T4r	T5r	T6r
Survey date/s	24 May 2017	24 May 2017	23 May 2017	22 May 2017	23 May 2017	23 May 2017
Combined survey data						
Number of species caught	3	2	3	3	4	2
Brown trout <i>Salmo trutta</i>		✓	✓	✓	✓	✓
Bullhead <i>Cottus gobio</i>	✓		✓	✓	✓	✓
European eel <i>Anguilla anguilla</i>	✓				✓	
3-spined sb <i>Gasterosteus aculeatus</i>	✓	✓	✓	✓	✓	
Survey summary (excluding minor species*)						
Overall density (no./100m ²)	1.6	1.3	0.7	1.1	2.7	2.2
Overall biomass (g/100m ²)	643.8	283.3	179.3	265.6	455.1	123.4
Survey summary (all species)						
Overall density (no./100m ²)	15.6	2.3	4.7	9.6	6.9	12.6
Overall biomass (g/100m ²)	652.0	284.1	181.9	274.2	457.2	128.7
Number of fish caught	8	6	12	34	59	61
Population estimate (catch depletion)	10	7	14	36	62	63
Total weight caught (g)	416	851.5	544.5	1026	3956	587
Total weight estimate (inc. catch depletion; g)	417.3	852.3	545.7	1028	4115	643.6
Species present / absent						
Salmonids	Absent	Present	Present	Present	Present	Present
Invasive fish species	Absent	Absent	Absent	Absent	Absent	Absent

* Minor species excluded from calculations are bullhead & 3-spined stickleback.

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3.2 Till lamprey ammocoete data

3.2.1 Summary lamprey survey data is presented in Table 3-2 for the six 500m survey reaches sampled on the River Till.

Table 3-2 Lamprey summary data for the River Avon Survey reaches

Survey stretch ID	T1r	T2r	T3r	T4r	T5r	T6r
Survey date	24 May 2017	24 May 2017	23 May 2017	22 May 2017	23 May 2017	23 May 2017
SURVEY TOTALS						
Combined survey data						
Number of river/brook lamprey caught	Zero	Zero	Zero	Zero	Zero	Zero

4 Fisheries data

4.1 Overview

4.1.1 The fisheries surveys conducted along the 3 km of the River Till yielded a total of four species. These were brown trout, bullhead, European eel and three-spined stickleback.

4.1.2 Numerically, the survey sites were dominated by the presence of minor species, with perennial reaches (T4r to T5r) tending to support a high biomass and density of brown trout (the most numerically abundant major species). Brown trout, bullhead and three-spined stickleback were well distributed throughout the six survey reaches with European eel being recorded in only T1r (1No. captured) and T5r (2No. captured).

4.1.3 Species richness was low, ranging from two to four species in the reaches surveyed. All but one of the reaches was found to support brown trout (absent from T1r). No invasive fish species were recorded.

4.1.4 When averaging reach values, the following population metrics apply to the 3 km of River Till surveyed (excluding minor species):

- Overall density (no./100m²) = 1.6
- Overall biomass (g/100m²) = 325.1

4.1.5 These metrics are very low when compared to the fish survey programme conducted on the River Avon⁷, for which:

- Overall density (no./100m²) = 10.0
- Overall biomass (g/100m²) = 2,244.2

⁷ Atkins 2016. A303 AAJV Avon Fish Technical Note_v1.0.

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4.1.6 The highest and lowest fish density (excluding minor species) were recorded in Reach T5r (2.7 no./100m²) and T3r (0.7 no./100m²) respectively. The highest and lowest biomass (excluding minor species) were recorded in T1r (643.8 g/100m²) and T3r (179.3 g/100m²) respectively. Both metrics were strongly influenced by the abundance and size of brown trout captured at each survey reach.

4.1.7 No lamprey ammocoetes were recorded in any of the survey reaches.

4.1.8 The following sections provide a commentary on the characteristics of the fishery for each of the 500m reaches surveyed.

4.2 River Till T1r

4.2.1 The fully quantitative triple shock method was used to survey this reach. A representative 80 m sub-section of this reach was surveyed with an average width of 0.8m, resulting in a total survey area of 64m². The sub-section comprised run and glide habitats with an average depth of 0.25m (maximum depth 0.5m). Substrate was predominantly gravel (75%), with some cobble, sand and silt. Riparian vegetation consisted of grasses on both banks.

4.2.2 Three species were recorded at typically very low abundance: bullhead (2), European eel (1) and three-spined stickleback (5), this equates to an overall density estimate of 1.6 no./100 m² and an overall biomass estimate of 643.8 g/100 m² (excluding minor species). The high biomass being driven by the large size of the eel captured (620 mm).

4.2.3 No lamprey were recorded from surveys of the optimal (5m²) and sub-optimal (10m²) habitat identified within the reach.

4.3 River Till T2r

4.3.1 The fully quantitative triple shock method was used to survey this reach. A representative 100m sub-section of this reach was surveyed with an average width of 3.0m, resulting in a total survey area of 300m². The sub-section was dominated by glide habitat (70%) with riffle, run and pool habitats also present. Average depth was 0.4m (maximum depth 0.75m). Substrate was a mixture of silt, sand, gravel, cobble and pebble. Riparian vegetation consisted of trees, herbs and grasses.

4.3.2 Only two species were recorded: brown trout (4) and three-spined stickleback (2). As a result the overall density and biomass estimates were lower than those recorded at T1r, at 1.3 no./100m² and 283.3 g/100m² (excluding minor species).

4.3.3 No lamprey ammocoetes were recorded from surveys of the optimal (75m²) or sub-optimal habitat identified (8m²) in the reach.

4.4 River Till T3r

4.4.1 The fully quantitative triple shock method was used to survey this reach. A representative 75m sub-section of this reach was surveyed with an average width of 4.0m, resulting in a total survey area of 300m². The sub-section was composed of run (60%) and glide habitat (40%). Average depth was 0.25m (maximum depth 0.5m). Substrate was a

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dominated by gravel (60%) with a mixture of silt, sand, cobble and pebble also present. Riparian vegetation consisted of trees, herbs and grasses.

4.4.2 Three species were recorded: brown trout (2), bullhead (7) and three-spined stickleback (3). Due to the low number of trout captured within the surveyed area, the density estimate was the lowest recorded on the River Till at 0.7 no./100m² (excluding minor species).

4.4.3 No lamprey ammocoetes were recorded from surveys conducted on the optimal (75m²) or sub-optimal habitat identified (8m²) in the reach.

4.4.4 Riparian vegetation consisted of mixed woodland, grasses and sedges.

4.4.5 No lamprey ammocoetes were recorded from surveys of the sub-optimal habitat identified (175m²) in the reach. Optimal habitat for lamprey was absent.

4.5 River Till T4r

4.5.1 The fully quantitative triple shock method was used to survey two separate representative sub-sections of the reach. The first sub-section was a 25m length of river with an average width of 5m resulting in a survey area of 125m². This sub-section comprised glide habitat with an average depth of 0.3m (maximum depth 0.5m) characterised by the dominance of gravel (60%) with silt, sand and cobble.

4.5.2 The second sub-section was a 50m length of river with an average width of 5.0m resulting in a survey area of 250m². This sub-section comprised of glide habitat with an average depth of 0.4m (maximum depth 0.6m). Substrate composition differed to the first sub-section with pebble being recorded alongside silt, sand and cobble.

4.5.3 Riparian vegetation consisted of grasses on both banks within each of the sub-sections.

4.5.4 Three species were recorded from the combined sub-sections: brown trout (4), bullhead (15) and three-spined stickleback (15) this equates to a relatively low density estimate of 1.1 no./100m² and a biomass estimate of 265.6 g/100m² (excluding minor species).

4.5.5 Despite the abundance of suitable lamprey ammocoete habitat identified in the reach (optimal (140m²) and sub-optimal (140m²)), none were recorded at survey.

4.6 River Till T5r

4.6.1 The fully quantitative triple shock method was used to survey this reach. A representative 100m sub-section of this reach was surveyed with an average width of 9.0m, resulting in a total survey area of 900m². The sub-section was dominated by glide habitat (80%) with riffle and run also present. Average depth was 0.2m (maximum depth 0.5m). Substrate was dominated by gravel (75%) with a mixture of silt, sand and pebble also present. Riparian vegetation consisted of grasses and trees on both the left and right bank.

4.6.2 Four species were recorded: brown trout (21), bullhead (19), European eel (2) and three-spined stickleback (17). Due to the relatively high number of trout captured within the surveyed area, the density estimate was the highest recorded on the River Till at

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2.7 no./100m² (excluding minor species) and the biomass the second highest recorded at 455.1 g/100m².

4.6.3 No lamprey ammocoetes were recorded from surveys conducted on the optimal (140m²) or sub-optimal habitat identified (20m²) in the reach.

4.7 River Till T6r

4.7.1 The fully quantitative triple shock method was used to survey this reach. A representative 100m sub-section of this reach was surveyed with an average width of 5.0m, resulting in a total survey area of 500m². The sub-section was dominated by run and glide habitat with an average depth of 0.3m (maximum depth 0.4m). Substrate was dominated by gravel (50%) with a mixture of silt, sand and cobble also present. Riparian vegetation consisted of grasses and trees on both the left and right bank.

4.7.2 Only two species were recorded: brown trout (10) and bullhead (51). Due to the relatively high number of trout captured within the surveyed area, the density estimate was the second highest recorded on the River Till at 2.2 no./100m² (excluding minor species), however, their generally small size range (122 – 185mm) resulted in a low biomass estimate of 123.4 g/100m².

4.7.3 No lamprey ammocoetes were recorded from surveys conducted on the optimal (80m²) or sub-optimal habitat identified (5m²) in the reach.

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Arup Atkins Joint Venture Approvals

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P01	Author	Ian Morrissey		19 June 2017
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	Checker	Liz Brown		21 June 2017
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