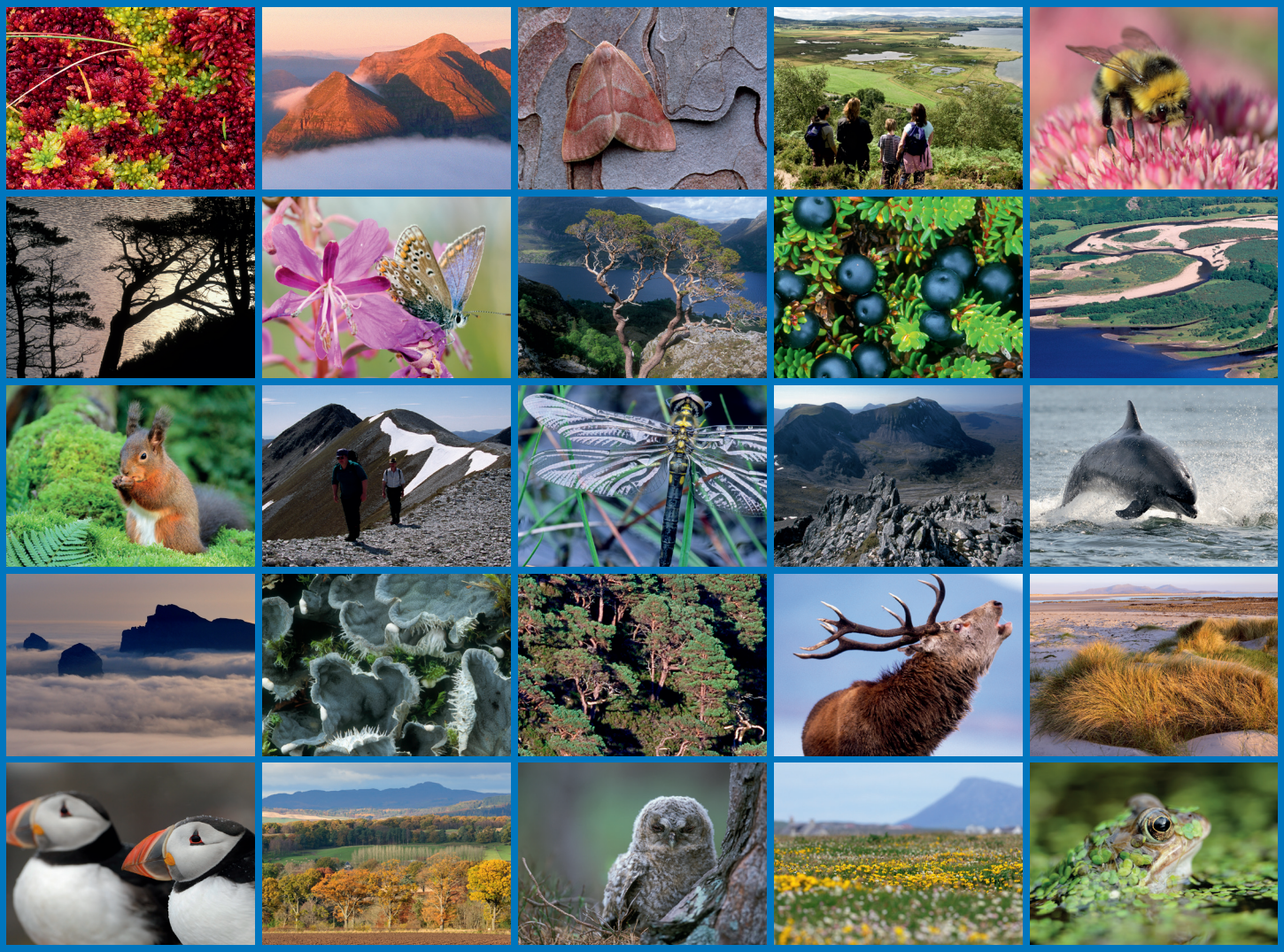
Scottish Natural Heritage
Research Report No. 1094

Survey of *Brachyptera putata* (Newman) (Plecoptera, Taeniopterygidae) – a stonefly endemic to Scotland



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RESEARCH REPORT

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Survey of *Brachyptera putata* (Newman) (Plecoptera, Taeniopterygidae) – a stonefly endemic to Scotland

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RESEARCH REPORT

Summary

Survey of *Brachyptera putata* (Newman) (Plecoptera, Taeniopterygidae) – a stonefly endemic to Scotland

Research Report No. 1094
Project No: 016928
Contractor: Buglife – The Invertebrate Conservation Trust
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Keywords

Northern February red stonefly; *Brachyptera putata*; stonefly; Cairngorms; Plecoptera; rivers

Background

The Northern February red stonefly (*Brachyptera putata*) is globally restricted to watercourses in the Scottish Highlands. Outside of Scotland, this species has only ever been found in two areas – the River Usk in Wales and the Wye near Hereford, where it is now thought to be extinct. As an endemic species, the UK population is of international significance.

Surveys in the last 15 years have confirmed that the Northern February red is present in the Dee from Linn of Dee downstream, a number of Dee tributaries and along the River Spey. This survey, conducted during the winter of 2016 and 2017, aimed to update our knowledge of the distribution of the Northern February red by surveying a range of rivers in the Cairngorms National Park.

Main findings

- Samples were collected from 26 sites on 13 watercourses. Over 900 Plecoptera specimens and nearly 400 Ephemeroptera specimens were collected and identified.
- Twenty-one species of stonefly were recorded during the present survey. Most rivers were home to seven to nine stonefly species. However, three watercourses were found to be more speciose: The River Avon with 11 species; the River Spey with 14 species; and the River Muick with 16 species.
- *Brachyptera putata* larvae were only found in the main stem of the River Spey from Newtonmore downstream. Adults were recorded at Kingussie, Boat of Garten and Grantown-on-Spey.
- The present survey concentrated on sampling larvae by 'kick sampling' in rivers. However it also confirmed the importance of winter sunlight and adults where found 'basking' on bankside fenceposts along the River Spey. After completion of this survey's fieldwork volunteers continued to record adult *B. putata* by examining fenceposts in sunlight. A single adult female was recorded from the River Dee at Balmoral. Further afield a record of an adult female was reported from the River Conon near Marybank. This sighting represents the first record of this species from the Conon.

- It is clear that looking for adult *B. putata* on bankside fenceposts is a useful survey technique. It is recommended that a public survey for this species is developed.

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This survey was jointly funded by Scottish Natural Heritage, the Cairngorms National Park Authority and Buglife.

1. INTRODUCTION

The Northern February red (*Brachyptera putata*) is an endemic stonefly which has its stronghold in Scotland, particularly north-east Scotland and the Highlands. Outside of Scotland, this species has only ever been found in two areas – the River Usk in Wales and the Wye near Hereford, where it is now thought to be extinct. As an endemic species, the UK population is of international significance.

Wide-ranging surveys of sites in north-east Scotland, the Highlands and Herefordshire were undertaken in the early 2000s as part of the 'Action for Invertebrates' project (Middlebrook, 2005). These surveys found that the Northern February red is present in the Dee from Linn of Dee downstream, and in a number of the Dee tributaries. Equally there are records from all along the Spey. A recent appraisal of the potential for hydro-power in the Cairngorms identified 57 sites where financially viable schemes could be developed (Forrest, 2016). The current research aimed to update our knowledge of the distribution of the Northern February red by undertaking surveys on rivers in the Cairngorms National Park which have been identified as having potential for small-scale hydro-power schemes but remain unsurveyed.

2. METHODS

2.1 Fieldwork

Representative locations on each watercourse were searched for the species by kick-sampling between December 2016 and February 2017. Accurate site references were obtained using a Garmin Etrex H GPS unit and upstream and downstream photographs were taken of all sites.

The kick sampling methods followed those detailed by Hammett (2002). Kick sampling is a standard technique employed by biologists to sample aquatic invertebrates and entails the disturbance of patches of gravel and stones and the collection of dislodged invertebrates in a standard pond net fitted with a 1mm gauge net positioned immediately downstream of the sampler. However, the habitat of the Northern February red presents particular problems and requires some adaptation of the technique. In particular, there are typically a lot of large stones on the riverbed that would not be displaced by casual 'kicking'. Such stones must be deliberately dislodged, by hooking a foot underneath them (for example), in order to disturb smaller material underneath.

A 5 metre transect was sampled at each site. Due to the river substrate in most of the rivers visited, continuous transects were impossible. It was possible however to work around large secure stones in order to obtain samples. If *Brachyptera* larvae were absent from the first sample then further samples were collected. There was no time limit to the sampling but typically sampling lasted for up to 15 minutes. Care was taken to avoid areas that were not permanently wetted by the river such as submerged shingle beaches and overflow channels. Similarly, care was taken to avoid salmon redds and areas which may contain freshwater pearl mussels.

Samples were sorted on site and representative specimens of stoneflies and mayflies were retained. All larvae of the family Taeniopterygidae were retained for identification. Voucher specimens were preserved in 70% isopropanol and have been retained by the author.

To complement the searches for larvae, bankside structures such as bridges and fence posts were examined for adult stoneflies. Stones on gravel bars and along the banks of the watercourses were also examined. Any adult stoneflies were either identified in the field or retained in 70% isopropanol for later examination. Further searches for *Brachyptera putata* adults were also undertaken by volunteers. Specimens were photographed by the volunteers and verified by the author.

Identifications of collected specimens were made using a stereomicroscope with a maximum magnification of 45 times. The current keys for stoneflies (Hynes, 1977) and mayflies (Elliott and Humpesch, 2010) were used.

3. RESULTS

Samples were collected from 26 sites on 13 watercourses (Table 1). Over 900 Plecoptera specimens and nearly 400 Ephemeroptera specimens were collected and identified. A summary of the results are provided in Tables 2 and 3.

Twenty-one species of stonefly were recorded during these surveys. Most rivers were home to seven to nine stonefly species however three watercourses were found to be more speciose: The River Avon with 11 species; the River Spey with 14 species; and the River Muick with 16 species. *Isoperla grammatica*, *Leuctra hippopus* and *L. inermis* were found in most rivers, with *Protonemura meyeri* and *P. praecox* also very common.

Brachyptera putata larvae were only found in the main stem of the River Spey from Newtonmore downstream. Adults were recorded at Kingussie, Boat of Garten and Grantown-on-Spey. At Kingussie, adults were found under stones on a gravel bar downstream of the road bridge and exuviae on the bridge abutment. At Boat of Garten, females were found along the road bridge parapet and males and females on fence posts located c. 17m from the river on the downstream left bank. At Grantown-on-Spey, males and females were found on fence posts located c. 42m from the river on the downstream right bank.

Immature *Brachyptera risi* larvae were collected from most upland sites however a mature larvae of this species was also found on the River Spey at Newtonmore.

The endemic species *Perlodes mortoni* was recorded at 12 sites across seven watercourses. The endemic sub-species *Taeniopteryx nebulosa britannica* was found in large numbers in the River Muick at the Spittal of Glenmuick. Also found in the River Muick was a second endemic subspecies, *Capnia vidua anglica*, which was found upstream of the Linn of Muick and at Mill of Sterin. *Protonemura montana*, a high altitude species, was only found in the Cairnwell Burn upstream of Glenshee Ski Centre at an altitude of 674 metres. *Nemurella picteti* was also only found at this site. *Siphonoperla torrentium* was recorded from eight rivers however *Chloroperla tripunctata* was only found at two sites, both on the River Spey.

Thirteen species of mayflies were recorded during these surveys. *Baetis rhodani* was ubiquitous, being found at all 26 sites. *Rhithrogena* spp. were found in all rivers apart from the highest altitude sites on the Cairnwell Burn and Conglass Water. In most rivers the specimens were small and were likely to be *Rhithrogena semicolorata*. Mature nymphs that conformed to the diagnostic characteristics of *R. germanica* were however found in the River Spey at Kingussie and Boat of Garten. Nine species were recorded from the River Spey including the Scottish Biodiversity List species *Baetis niger* which was found at Garva Bridge and Kingussie. The River Spey was also the only watercourse where *Rhithrogena germanica*, *Leptophlebia vespertina* and *Paraleptophlebia submarginata* were recorded. *Ameletus inopinatus*, a species under threat from rising water temperatures was found in the River Don at Cockbridge, Conglass Water and Cairnwell Burn. Unusually, it was also found at the lowest site on the River Avon, at Delnashaugh, but was not recorded at higher altitudes. It is likely that further sampling at upstream sites would find this species.

Leptophlebia marginata was only found in the River Luineag immediately downstream of Loch Morlich. This species is common in Loch Morlich and it is likely that the specimens collected at this site originated from the loch.

Details of each sample location are given below together with a summary of the species recorded.

Table 1. Locations surveyed

Catchment	Location	Grid Reference	Sample Date
Dee	Cairnwell Burn at Glenshee Ski Centre	NO1414077679	07/01/2017
Dee	River Gairn at Gairnshiel Bridge	NJ2953200837	06/01/2017
Dee	River Gairn downstream Morven Cottages	NO3423399353	06/01/2017
Dee	River Muick at Mill of Sterin	NO3502192862	07/01/2017
Dee	River Muick at Spittal of Glenmuick	NO3051085276	07/01/2017
Dee	River Muick upstream Linn of Muick	NO3274488952	07/01/2017
Dee	River Quoich at Allanaquoich	NO1181791067	06/01/2017
Don	River Don at Cockbridge	NJ2566609138	20/01/2017
Don	River Don at Culfork	NJ3291210553	20/01/2017
Spey	River Avon at Delnabo	NJ1629317325	20/01/2017
Spey	River Avon at Delnashaugh	NJ1846335178	20/01/2017
Spey	River Avon d/s Bridge of Avon	NJ1500720928	20/01/2017
Spey	Conglass Water at Well of Lecht	NJ2346615287	20/01/2017
Spey	River Druie at Coylumbridge	NH9162710513	22/01/2017
Spey	River Druie at Inverdruie	NH9021011051	22/01/2017
Spey	River Feshie at Feshiebridge	NH8495004808	22/01/2017
Spey	River Feshie at Glen Feshie	NH8436501155	22/01/2017
Spey	River Luineag at Badaguish	NH9396910231	20/12/2016
Spey	River Luineag at Loch Morlich	NH9561409670	20/12/2016
Spey	River Spey at Boat of Garten	NH9467318967	13/02/2017
Spey	River Spey at Garva Bridge	NN5224794808	13/02/2017
Spey	River Spey at Grantown on Spey	NJ0293326491	13/02/2017
Spey	River Spey at Kingussie	NN7598199790	13/02/2017
Spey	River Spey at Newtonmore	NN7112197990	13/02/2017
Tay	Allt A' Ghlinn Beag at Spittal of Glenshee	NO1111570035	06/01/2017
Tay	Shee Water at Spittal of Glenshee	NO1084470134	06/01/2017

Table 2. Stonefly species recorded

Species	Allt A' Ghlinn Beag	Avon	Cairnwell	Conglass	Don	Druie	Feshie	Gairn	Luineag	Muick	Quoich	Shee	Spey
Amphinemura sulcicollis		●				●	●	●	●	●	●		●
Brachyptera putata													●
Brachyptera risi			●	●	●	●	●	●		●		●	●
Capnia vidua anglica										●			
Chloroperla tripunctata													●
Dinocras cephalotes					●					●			●
Diura bicaudata			●	●									
Isoperla grammatica	●	●		●	●	●	●	●	●	●	●	●	●
Leuctra hippopus	●	●	●	●		●	●	●	●	●	●	●	●
Leuctra inermis	●	●	●	●	●	●	●	●		●	●	●	●

Leuctra moselyi		●	●		●		●			●			●
Leuctra nigra			●		●					●			
Nemurella picteti			●										
Perla bipunctata	●	●			●		●	●		●		●	●
Perlodes mortoni	●	●				●			●	●	●		●
Protonemura meyeri	●	●		●	●	●		●	●	●	●	●	●
Protonemura montana										●			
Protonemura praecox		●		●		●		●	●	●	●	●	●
Siphonoperla torrentium	●	●				●	●	●	●	●			●
Taeniopteryx nebulosa britannica										●			
Zwicknia bifrons	●	●		●									

Table 3. Mayfly species recorded

Species	**Allt A' Ghlinn Beag**	**Avon**	**Cairnwell**	**Conglass**	**Don**	**Druie**	**Feshie**	**Gairn**	**Luineag**	**Muick**	**Quoich**	**Shee**	**Spey**
Ameletus inopinatus		●	●	●	●								
Baetis muticus		●						●	●	●	●		●
Baetis niger													●
Baetis rhodani	●	●	●	●	●	●	●	●	●	●	●	●	●
Baetis sp.	●									●	●	●	
Caenis rivulorum		●											
Ecdyonurus sp.		●			●			●	●				●
Ecdyonurus venosus		●								●			●
Electrogena lateralis												●	
Heptagenia sulphurea									●				●
Leptophlebia marginata									●				
Leptophlebia vespertina													●
Paraleptophlebia submarginata													●
Rhithrogena germanica													●
Rhithrogena semicolorata													●
Rhithrogena sp.	●	●			●	●	●	●	●	●	●	●	●

3.1 River Dee Catchment

3.1.1 Cairnwell Burn

The Cairnwell Burn is a north-flowing tributary of the Clunie Water, which in turn is a tributary of the River Dee. A single sample was taken from close to the source of this watercourse, upstream of the Glenshee Ski Centre. The watercourse here is small, barely 500 mm wide, and less than 50 mm deep. The bed is composed of fine gravel and sand. Care was taken to limit sampling in this fragile headwater stream to prevent damage to the morphological structure of the watercourse.

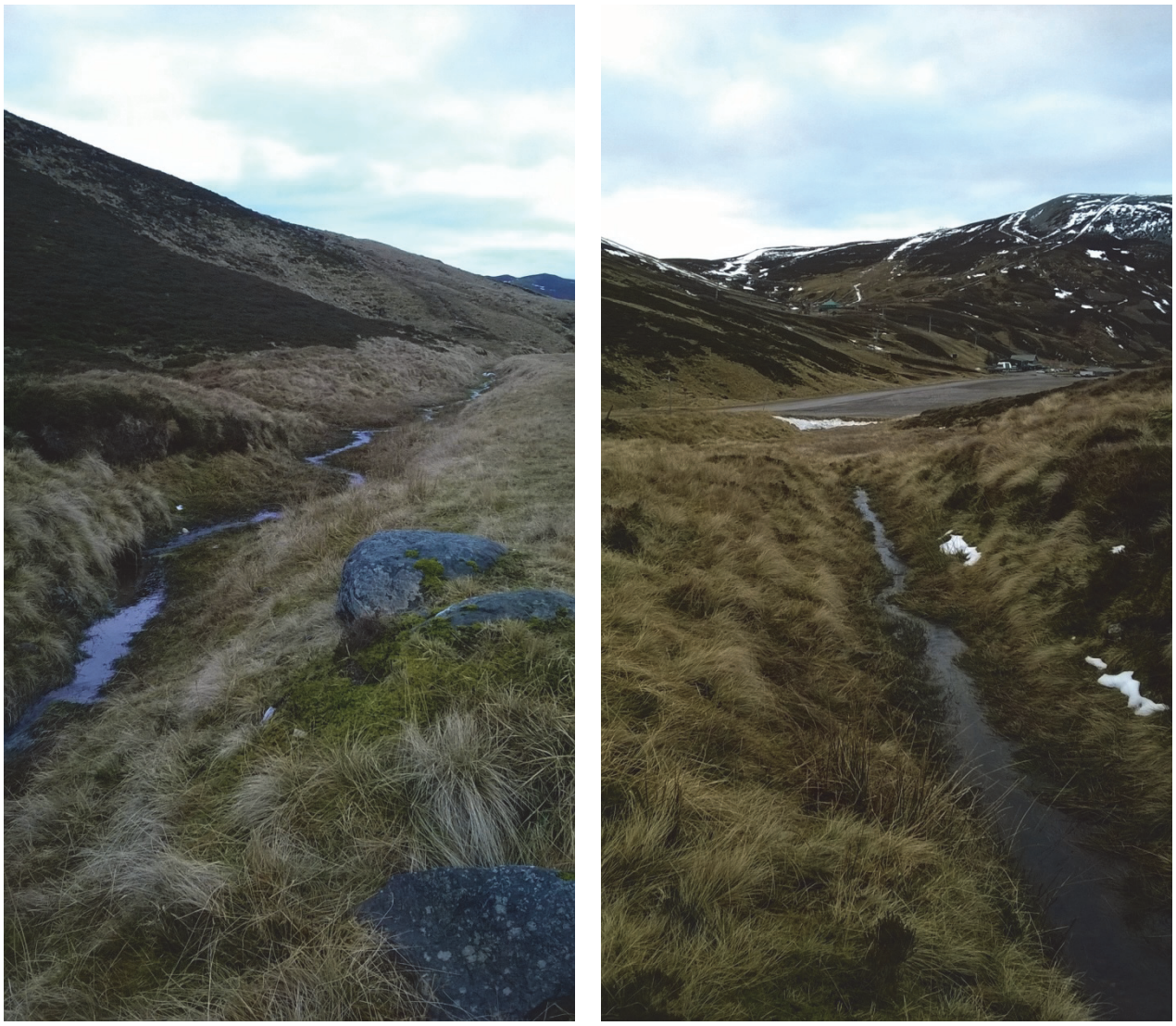


Figure 1. Cairnwell Burn at Glenshee Ski Centre: top – upstream; bottom - downstream

Table 4. Species collected from Cairnwell Burn at Glenshee Ski Centre

Order	Family	Species
Ephemeroptera	Ameletidae	*Ameletus inopinatus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Leuctridae	*Leuctra moselyi*
Plecoptera	Leuctridae	*Leuctra nigra*
Plecoptera	Nemouridae	*Nemurella picteti*
Plecoptera	Perlodidae	*Diura bicaudata*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Polycentropidae	*Plectrocnemia conspersa*

3.1.2 River Gairn

The River Gairn flows eastwards before turning to the south to join the River Dee at Bridge of Gairn north of Ballater. Two samples were taken from the lower River Gairn: at Gairnshiel; and downstream of Morvern Cottages.

3.1.2.1 River Gairn at Gairnshiel Bridge

The bed at Gairnshiel Bridge was moderately compacted and comprised of cobbles and small boulders with occasional pebbles, and much finer sediments. The flow here is moderate and there were filamentous algae present on the bed.

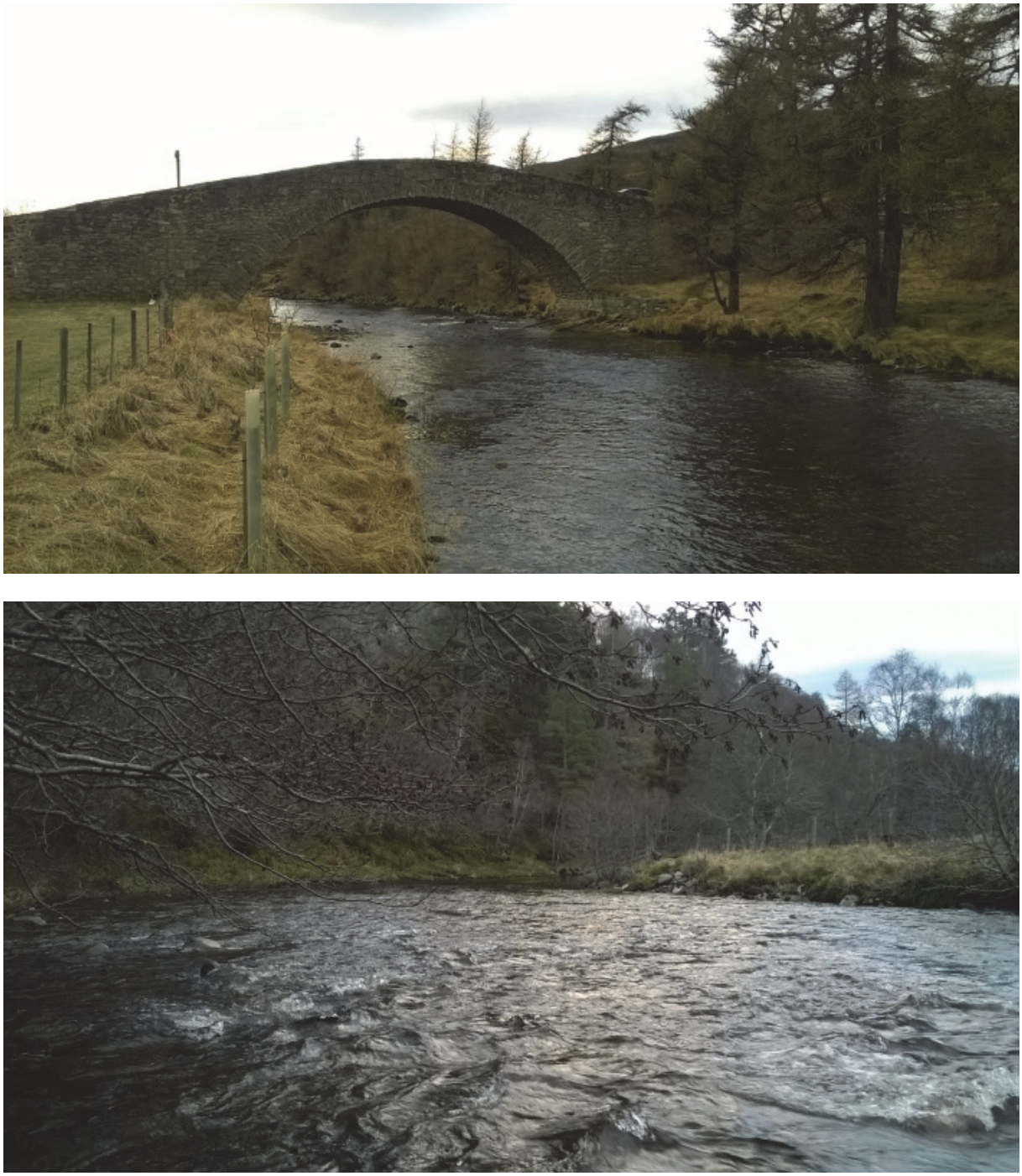


Figure 2. River Gairn at Gairnshiel Bridge: top – upstream; bottom – downstream

Table 5. Species collected from River Gairn at Gairnshiel Bridge

Order	**Family**	**Species**
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus sp.*
Ephemeroptera	Heptageniidae	*Rhithrogena sp.*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	*Hydropsyche sp.*
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*

3.1.2.2 River Gairn downstream of Morvern Cottages

The flow was faster at the lower sampling location downstream of Morvern Cottages and the bed was less compacted. The substrate comprised pebbles, large cobbles and medium sized boulders. The watercourse was shaded here by bankside trees.

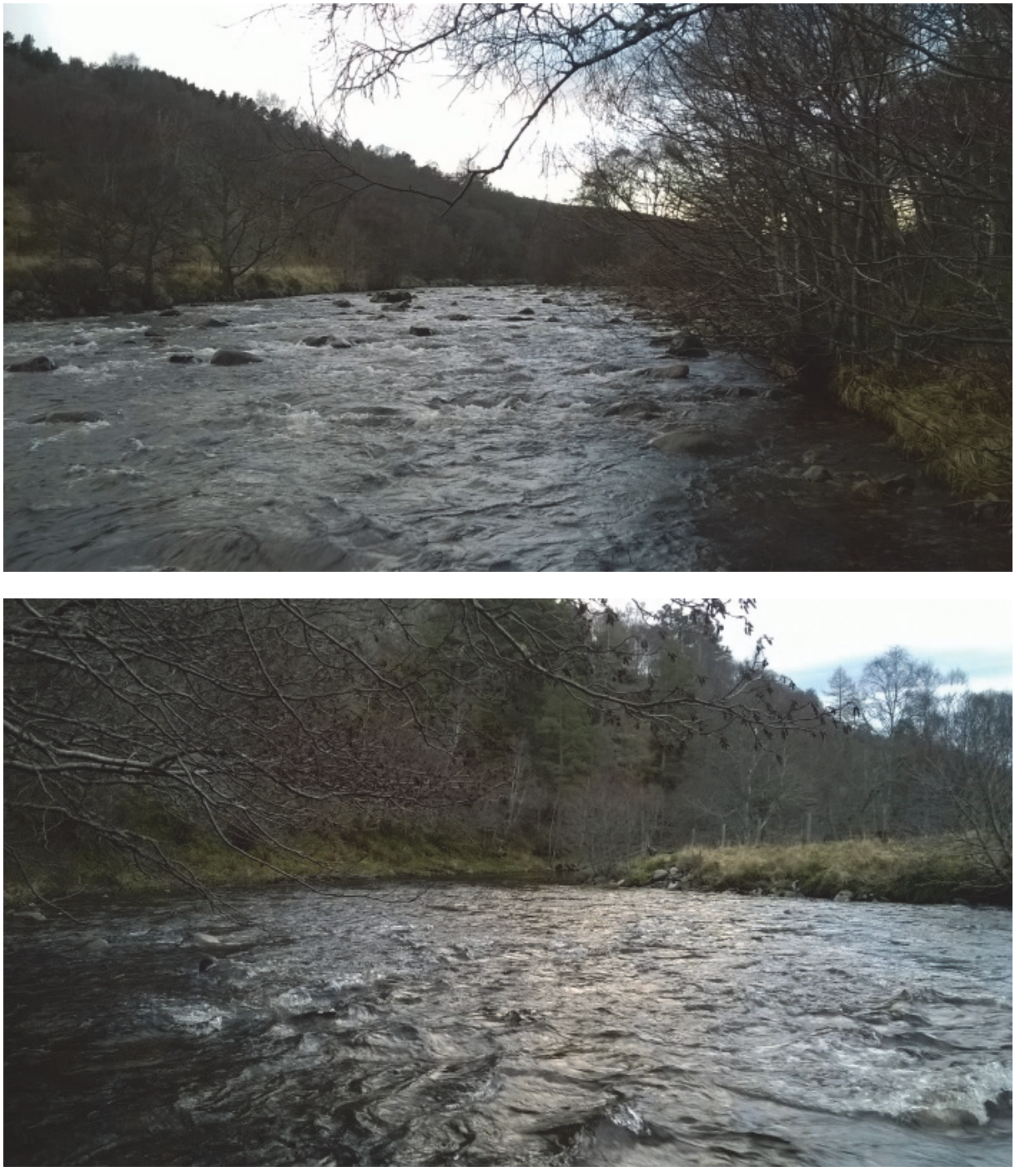


Figure 3. River Gairn downstream Morven Cottages: top – upstream; bottom – downstream

Table 6. Species collected from River Gairn downstream Morven Cottages

Order	**Family**	**Species**
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Mollusca	Lymnaeidae	*Radix balthica*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.
Tricladida	Planariidae	Planariidae

3.1.3 River Muick

The River Muick flows north-easterly from Loch Muick at the head of Glen Muick to its confluence with the River Dee at Bridge of Muick to the south of Ballater. Samples were taken at three locations in Glen Muick: at the Spittal of Glenmuick; upstream of the Linn of Muick; and at Mill of Sterin.

3.1.3.1 River Muick at Spittal of Glenmuick

At the Spittal of Glenmuick the River Muick is a typical upland watercourse with moderate to fast flows and a bed comprised of various sized cobbles, pebbles and the occasional boulder. It flows through an open landscape and there has been recent planting of broadleaf trees along the banks as part of the Pearls in Peril project.

Figure 4. River Muick at Spittal of Glenmuick: top – upstream; bottom – downstream

Table 7. Species collected from River Muick at Spittal of Glenmuick

Order	**Family**	**Species**
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Capniidae	*Capnia vidua anglica*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Leuctridae	*Leuctra moselyi*
Plecoptera	Leuctridae	*Leuctra nigra*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Plecoptera	Taeniopterygidae	*Taeniopteryx nebulosa britannica*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.1.3.2 River Muick upstream of Linn of Muick

At the middle site, upstream of the Linn of Muick, the bed is comprised of cobbles with pebbles and gravel in the slack water behind larger boulders. The banks have an open aspect however there is a conifer plantation on the downstream left bank.

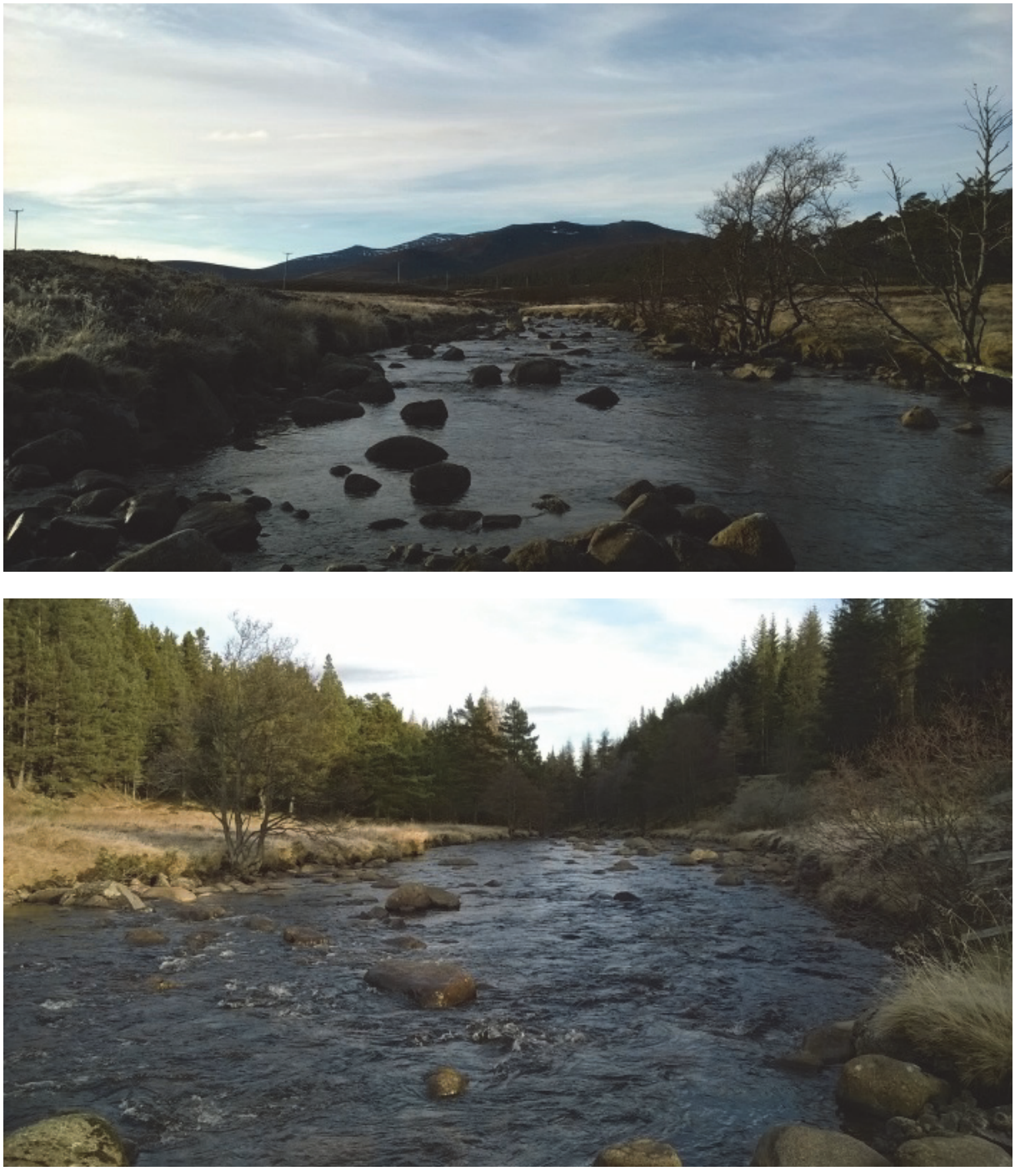


Figure 5. River Muick upstream of Linn of Muick: top – upstream; bottom – downstream

Table 8. Species collected from River Muick upstream of Linn of Muick

Order	**Family**	**Species**
Diptera	Simuliidae	Simuliidae
Diptera	Tipulidae	Tipulidae
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Baetidae	*Baetis* sp.
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Leuctridae	*Leuctra moselyi*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlidae	*Dinocras cephalotes*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	Hydropsyche sp.
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.1.3.3 River Muick at Mill of Sterin

The lowest site on the River Muick was located at Mill of Sterin. At this site there was evidence of a catastrophic erosion event caused by the floods in the wake of Storm Frank in December 2015. A large section of bank has been washed away, together with the road to the Mill of Sterin. The sample was taken upstream of this section were the bed was comprised of cobbles and boulders with pebbles and gravel in slacker water.

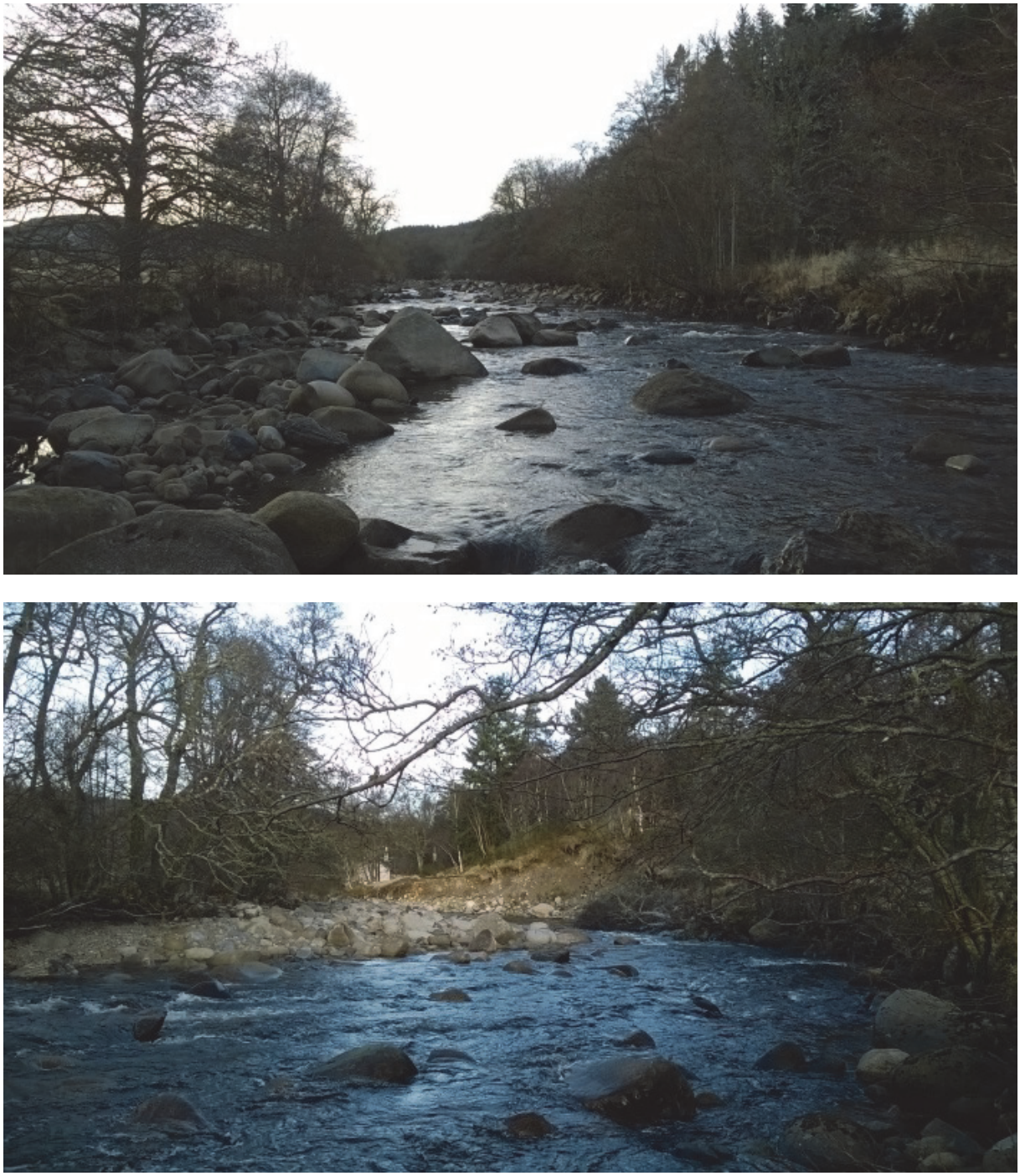


Figure 6. River Muick at Mill of Sterin: top – upstream; bottom – downstream

Table 9. Species collected from River Muick at Mill of Sterin

Order	Family	Species
Diptera	Simuliidae	Simuliidae
Diptera	Tipulidae	Tipulidae
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus venosus*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Capniidae	*Capnia vidua anglica*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura montana*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Limnephilidae	Limnephilidae
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.1.4 River Quioch

The River Quoich was sampled at a single location at Allanaquoich on the Mar Lodge Estate. The river here is actively braiding and has recently moved channel dramatically. The bed was comprised of cobbles and pebbles and was very unstable.

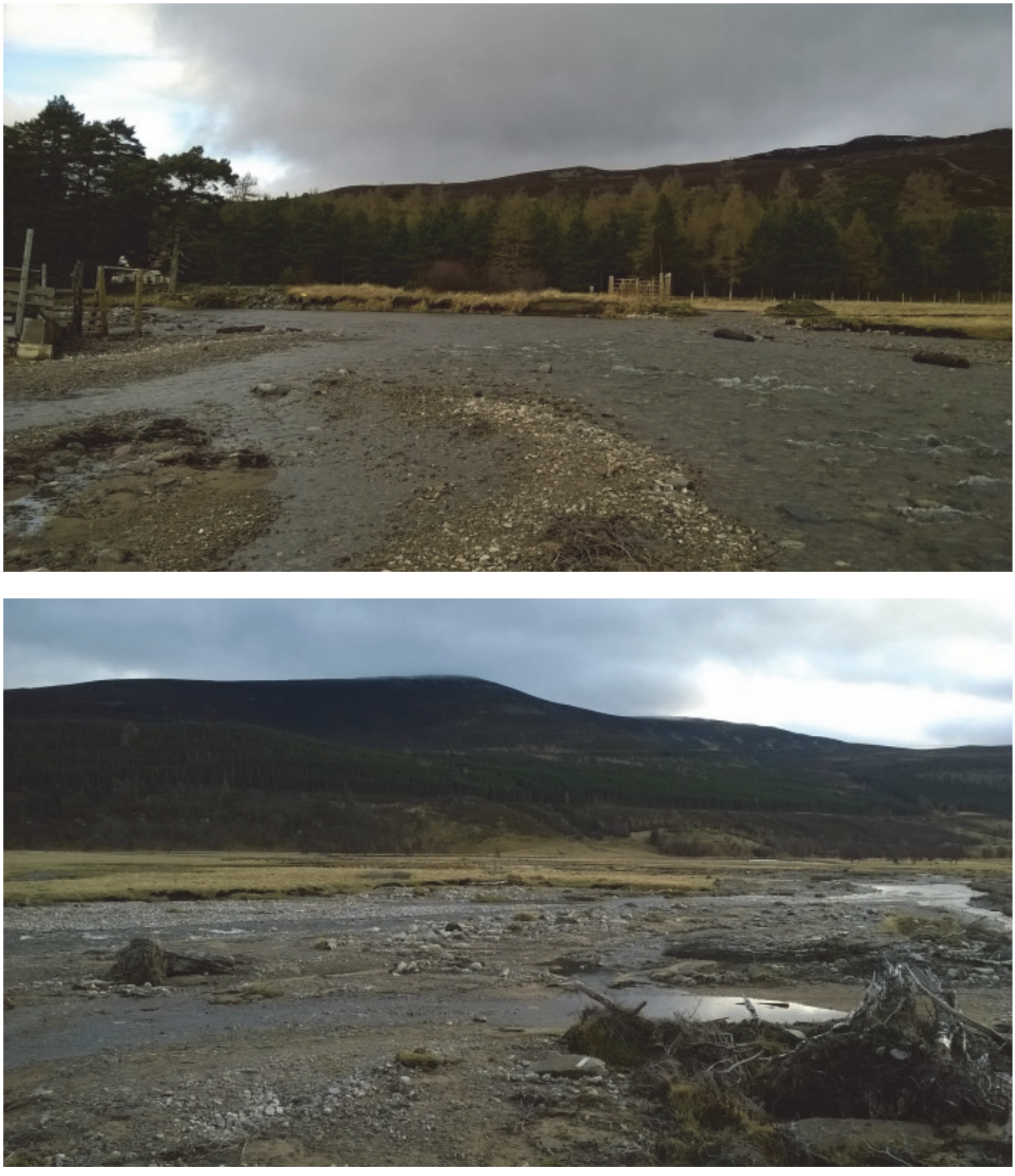


Figure 7. River Quioch at Allanaquoich: top – upstream; bottom – downstream

Table 10. Species collected from River Quioch at Allanaquoich

Order	**Family**	**Species**
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Baetidae	Baetis sp.
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Trichoptera	Limnephilidae	*Potamophylax* sp.

3.2 River Don Catchment

3.2.1 River Don

The River Don is a major river which flows eastwards to the North Sea north of Aberdeen. Two samples were taken from the upper river: at Cockbridge; and at Culfork.

3.2.1.1 River Don at Cockbridge

At Cockbridge the river runs through what appears to be a straightened, engineered channel. The bed of gravel and pebbles was moderately compacted and kick sampling released quantities of fine sand.

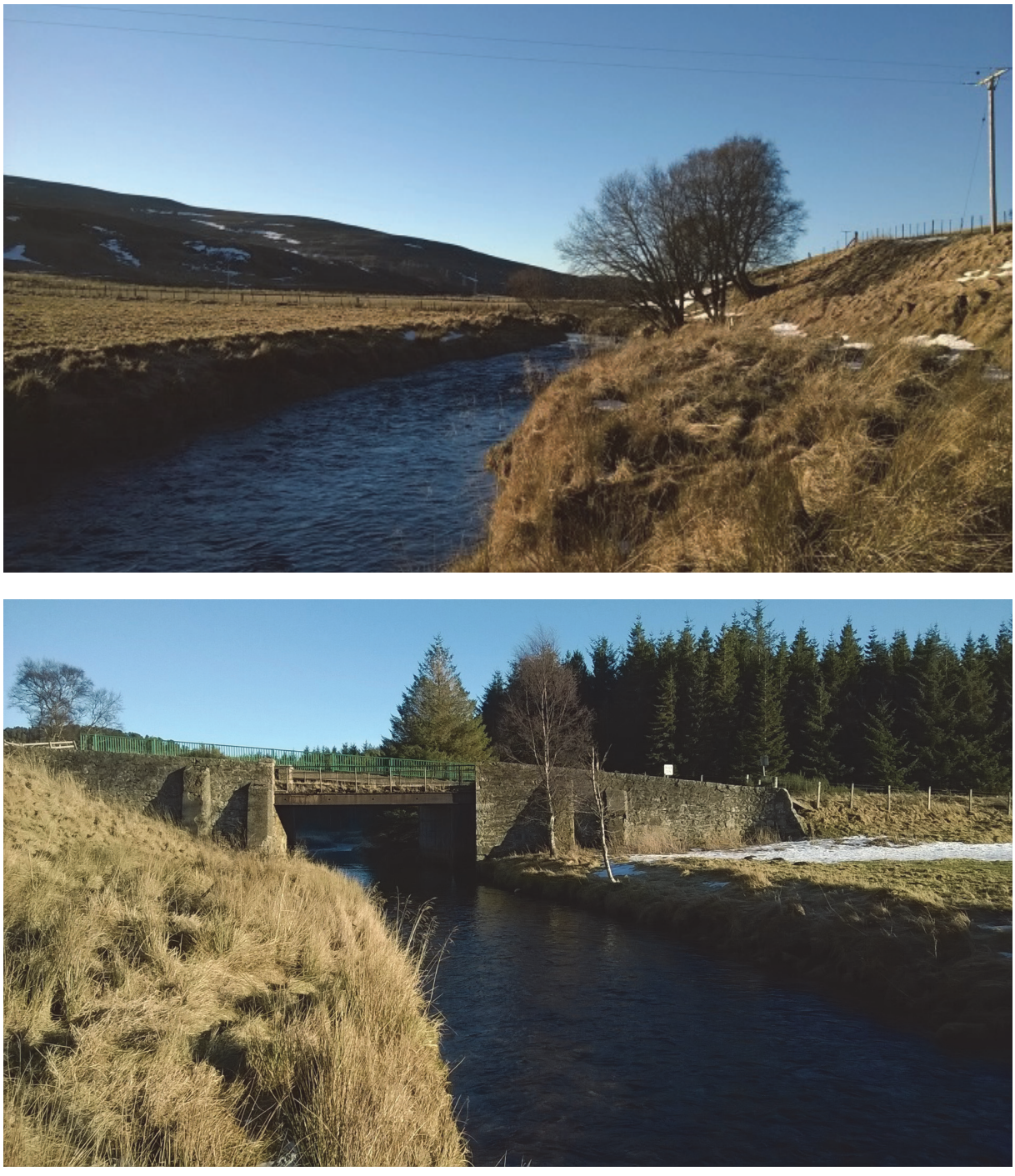


Figure 8. River Don at Cockbridge: top – upstream; bottom – downstream

Table 11. Species collected from River Don at Cockbridge

Order	**Family**	**Species**
Ephemeroptera	Ameletidae	*Ameletus inopinatus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Leuctridae	*Leuctra moselyi*
Plecoptera	Leuctridae	*Leuctra nigra*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.2.1.2 River Don at Culfork

Further down the River Don, including at the second sampling site at Culfork, the watercourse becomes heavily shaded by conifer plantations. The bed of pebbles and cobbles here was heavily compacted and kick sampling was particularly difficult.

Figure 9. River Don at Culfork: top – upstream; bottom – downstream

Table 12. Species collected from River Don at Culfork

Order	Family	Species
Amphipoda	Gammaridae	*Gammarus* sp.
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlidae	*Dinocras cephalotes*
Plecoptera	Perlodidae	*Isoperla grammatica*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3 River Spey Catchment

3.3.1 River Spey

The River Spey rises in the Monadhliath Mountains and flows north-eastwards for 172 kilometres to the coast at Spey Bay. The Spey was sampled at five locations: at Garva Bridge; Newtonmore; Kingussie; Boat of Garten; and Grantown-on-Spey.

3.3.1.1 River Spey at Garva Bridge

The site at Garva Bridge is in the upper reaches of the river. The flow is fast and moderately turbulent and the bed is comprised of large cobbles interspersed with large boulders. In the margins and in slack water behind boulders there are pockets of pebbles and gravel. There is no bankside planting and the river has an open aspect.

Figure 10. River Spey at Garva Bridge: top – upstream; bottom – downstream

Table 13. Species collected from River Spey at Garva Bridge

Order	**Family**	**Species**
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis niger*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*
Plecoptera	Chloroperlidae	*Chloroperla tripunctata*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.1.2 River Spey at Newtonmore

At Newtonmore the river is much larger having been joined by two significant tributaries: the Truim and the Calder. The sample location here was between the B9150 road bridge and the railway bridge. The flow here was moderate, and the channel was approximately 55 to 60 metres wide. The bed was comprised of cobbles, pebbles and occasional larger boulders. Whilst there was some shading by bankside trees on the north bank the width of the channel means that light can still reach the water surface.

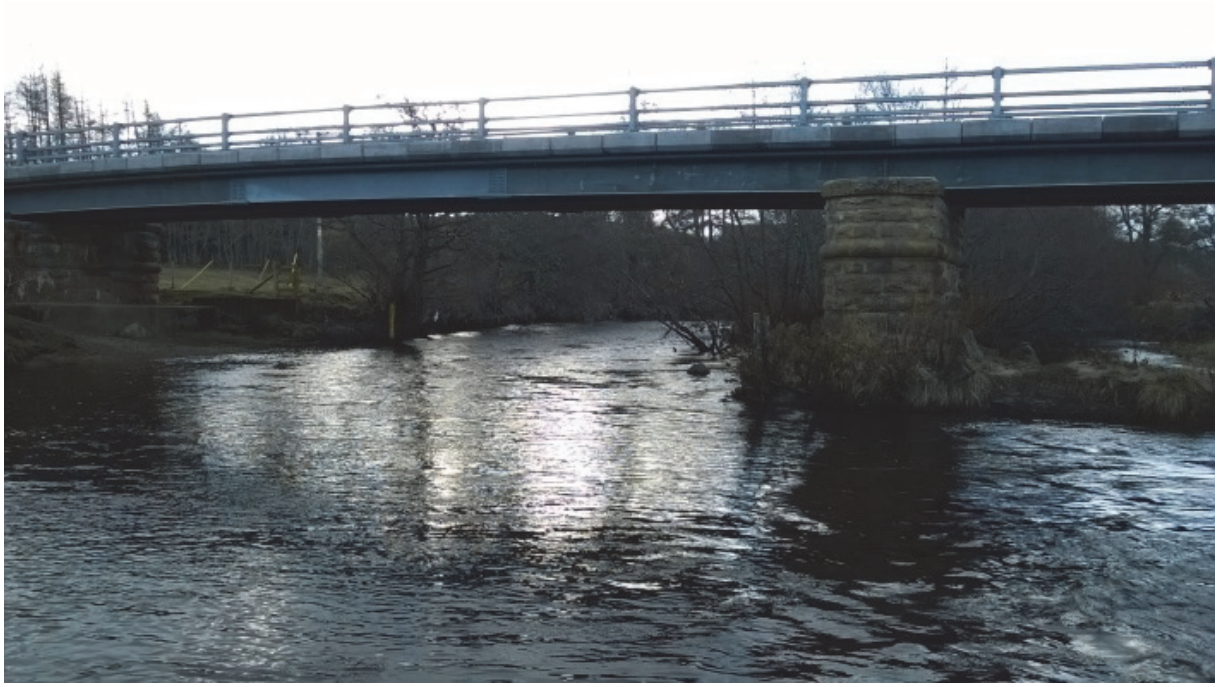
Figure 11. River Spey at Newtonmore: top – upstream; bottom – downstream

Table 14. Species collected from River Spey at Newtonmore

Order	**Family**	**Species**
Coleoptera	Elmidae	Elmidae
Coleoptera	Gyrinidae	Gyrinidae
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.
Ephemeroptera	Heptageniidae	*Ecdyonurus venosus*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Chloroperlidae	*Chloroperla tripunctata*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlidae	*Dinocras cephalotes*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Plecoptera	Taeniopterygidae	*Brachyptera putata*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Brachycentridae	*Brachycentrus subnubilus*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Limnephilidae	Limnephilidae
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.1.3 River Spey at Kingussie

The sampling location at Kingussie was located immediately downstream of the B970 road bridge. The river here was slower with a deep pool downstream of the sample location. The bed was comprised of cobbles and pebbles with some gravel in shallower areas. The channel here was slightly shaded by the moderately steep banks and bankside trees, however light was still able to reach the water surface.



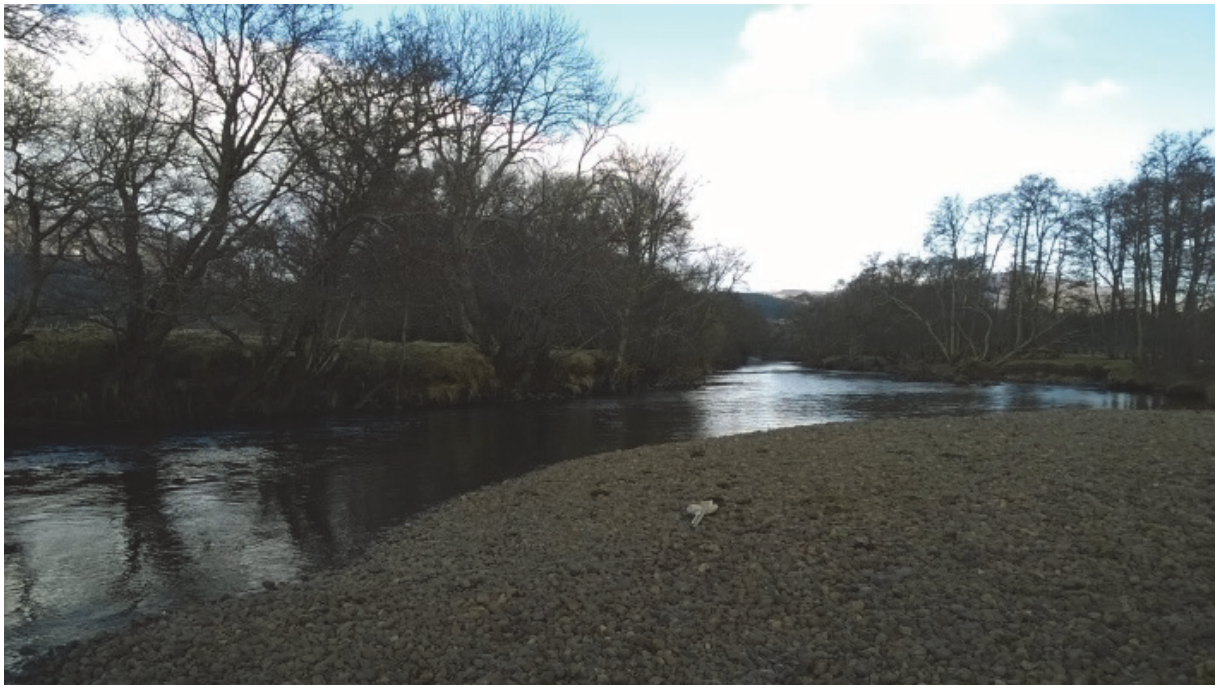


Figure 12. River Spey at Kingussie: top – upstream; bottom – downstream

Table 15. Species collected from River Spey at Kingussie

Order	Family	Species
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis niger*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*
Ephemeroptera	Heptageniidae	*Rhithrogena germanica*
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*
Ephemeroptera	Leptophlebiidae	*Leptophlebia vespertina*
Ephemeroptera	Leptophlebiidae	*Paraleptophlebia submarginata*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Plecoptera	Taeniopterygidae	*Brachyptera putata*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*

3.3.1.4 River Spey at Boat of Garten

The river at Boat of Garten is deep and fast flowing with several very large boulders in the watercourse. The bed is comprised of large cobbles and small boulders together with smaller pockets of pebbles and gravels. The downstream right bank is shaded by woodland however the opposite bank is more open and the river receives ample sunlight. The sample was taken from the downstream left bank approximately 100 metres downstream of Garten Bridge.

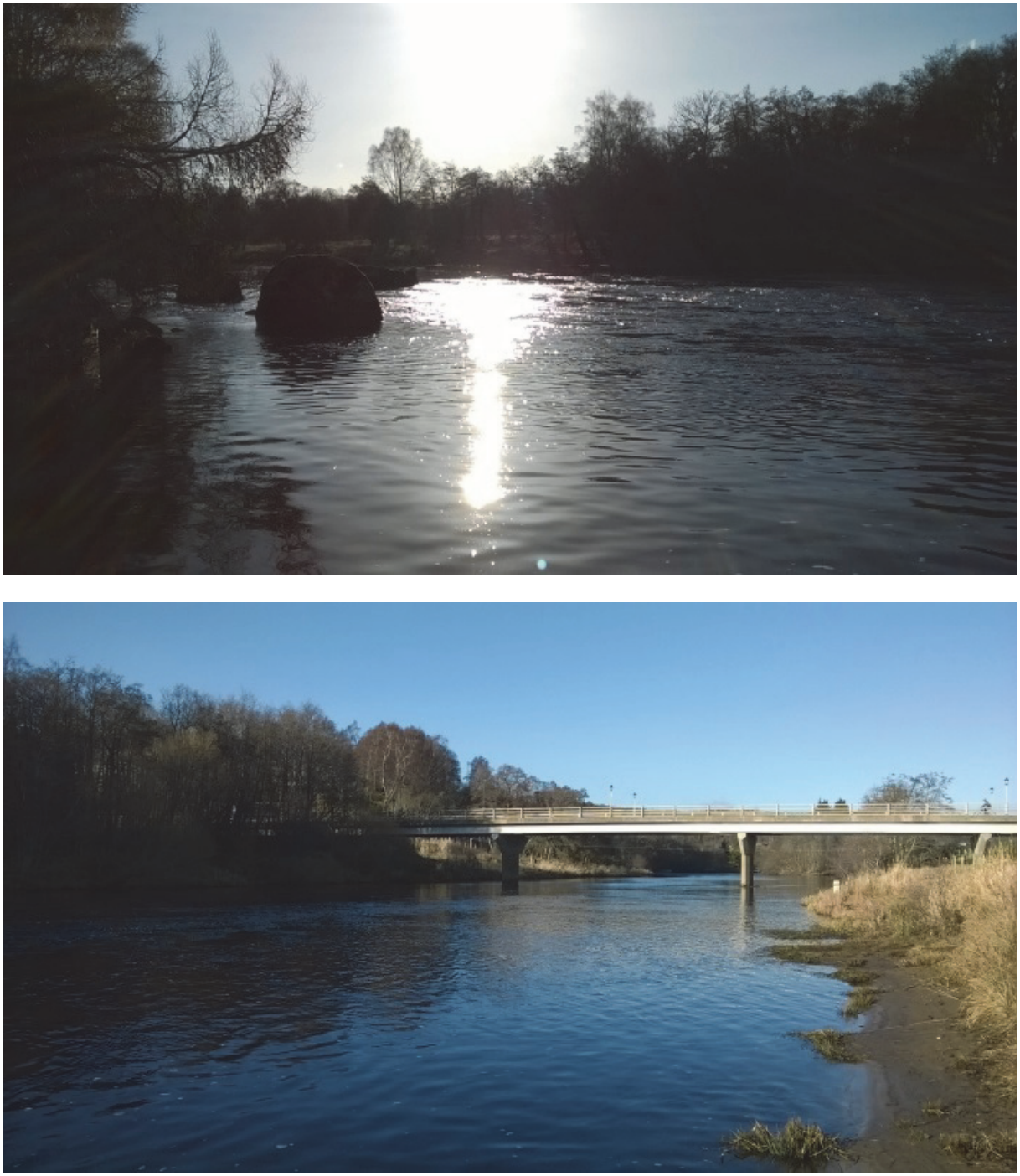


Figure 13. River Spey at Boat of Garten: top – upstream; bottom – downstream

Table 16. Species collected from River Spey at Boat of Garten

Order	**Family**	**Species**
Amphipoda	Gammaridae	*Gammarus* sp.
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*
Ephemeroptera	Heptageniidae	*Rhithrogena germanica*
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*
Mollusca	Ancylidae	*Ancylus fluviatilis*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera putata*
Trichoptera	Brachycentridae	*Brachycentrus subnubilus*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Tricladida	Planariidae	Planariidae

3.3.1.5 River Spey at Grantown-on-Spey

The lowest location sampled on the River Spey was at Grantown-on-Spey. The sample was taken approximately 600 metres upstream of the A95 road bridge on the downstream right bank. The river here is deep and fast flowing and sampling was only possible in the margins. The bed was mostly comprised of large cobbles and small boulders however smaller material was present close to the edge of the channel. The stretch sampled was in direct sunlight however it appeared that other parts of the river were shaded at times.

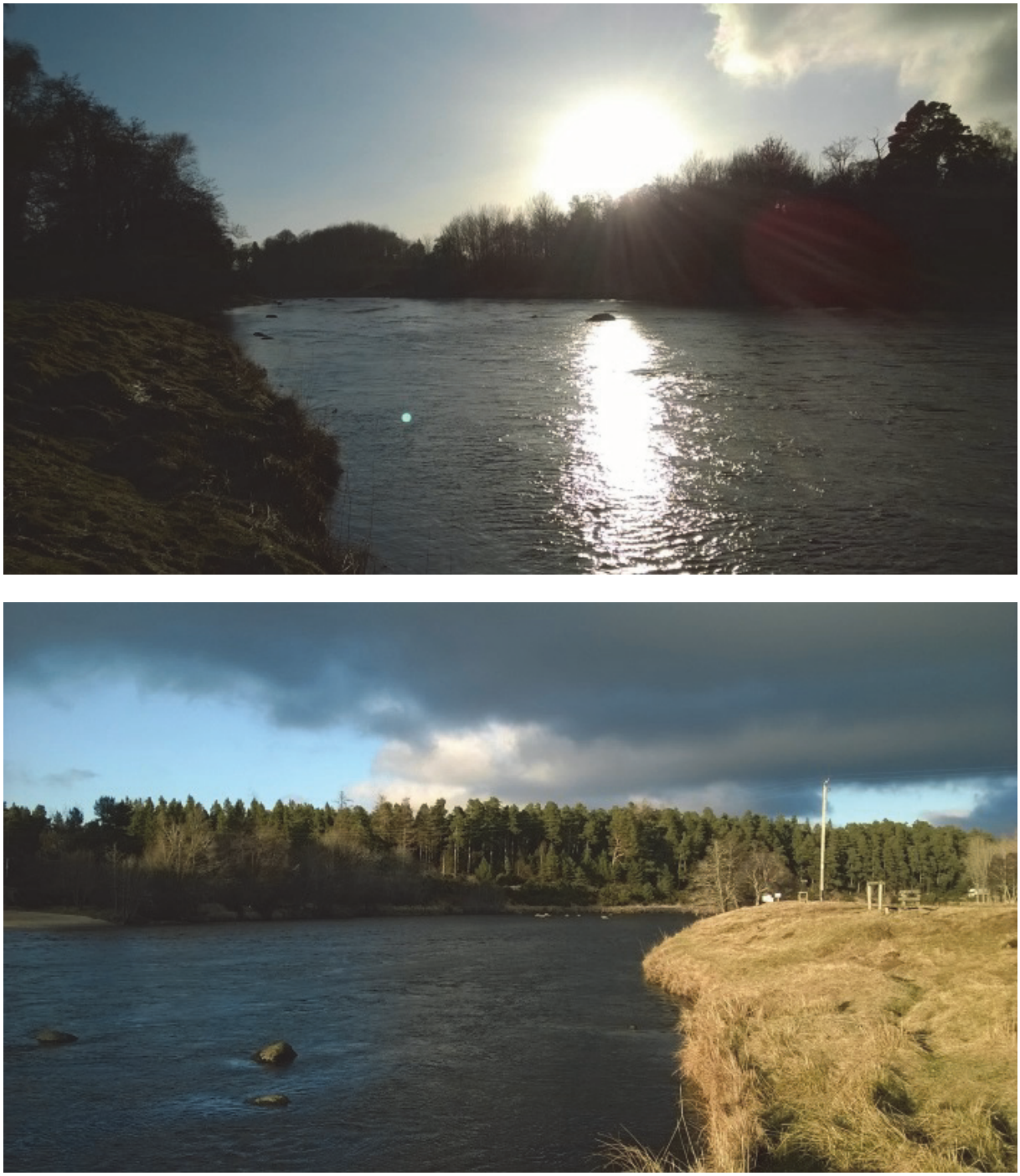


Figure 14. River Spey at Grantown-on-Spey: top – upstream; bottom – downstream

Table 17. Species collected from River Spey at Grantown-on-Spey

Order	Family	Species
Amphipoda	Gammaridae	*Gammarus* sp.
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena semicolorata*
Mollusca	Lymnaeidae	*Radix balthica*
Plecoptera	Leuctridae	*Leuctra moselyi*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera putata*
Trichoptera	Brachycentridae	*Brachycentrus subnubilus*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*
Tricladida	Planariidae	Planariidae

3.3.2 River Avon

This north-flowing watercourse is a major tributary of the River Spey, joining the main river at Ballindalloch. Three samples were taken from this watercourse: at Delnabo; downstream of Bridge of Avon; and at Delnashaugh.

3.3.2.1 River Avon at Delnabo

The river at Delnabo is a typical highland river with a bed comprised of boulders, cobbles and pebbles. The flow is fast, with slacker water downstream of larger boulders.

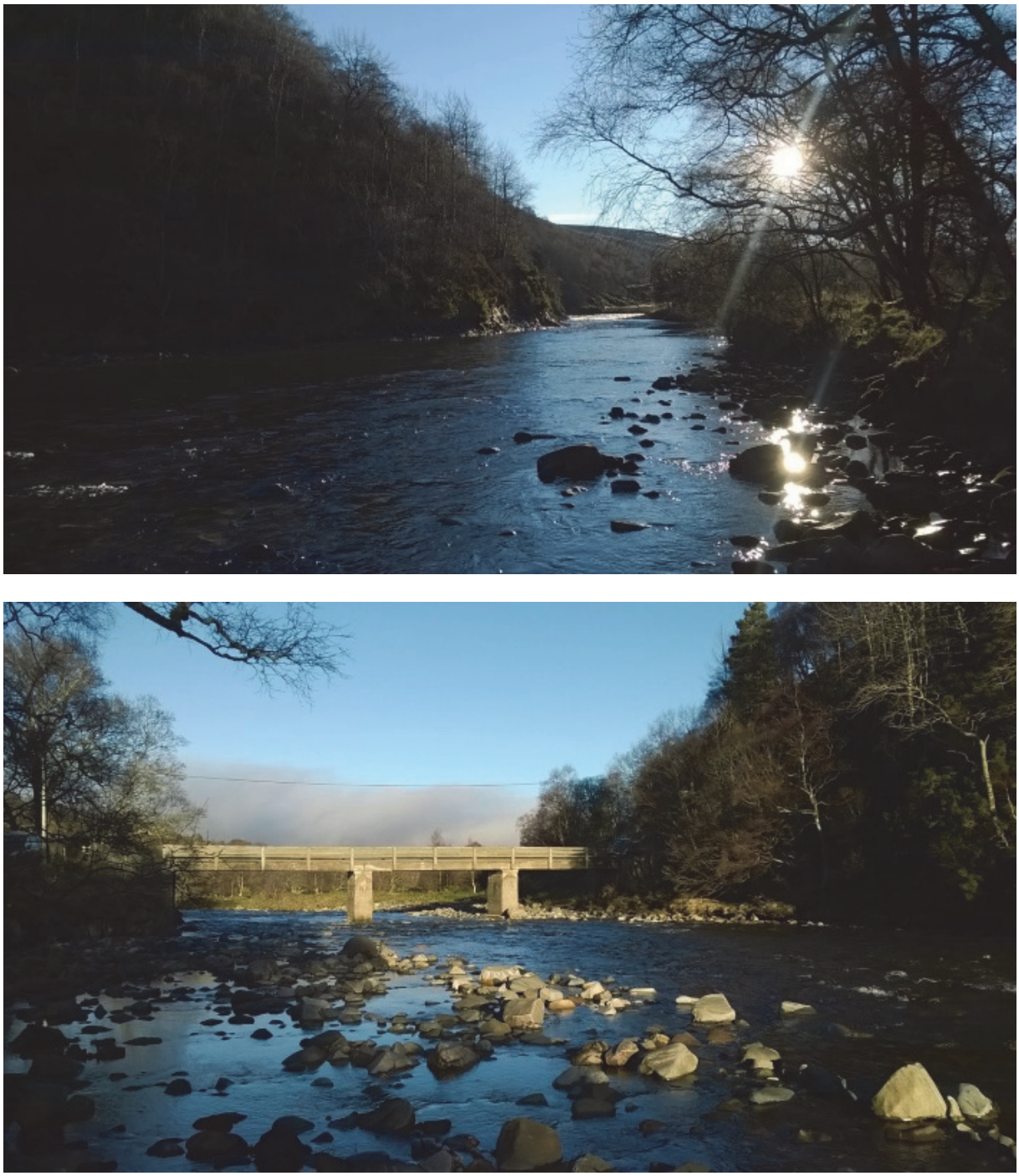


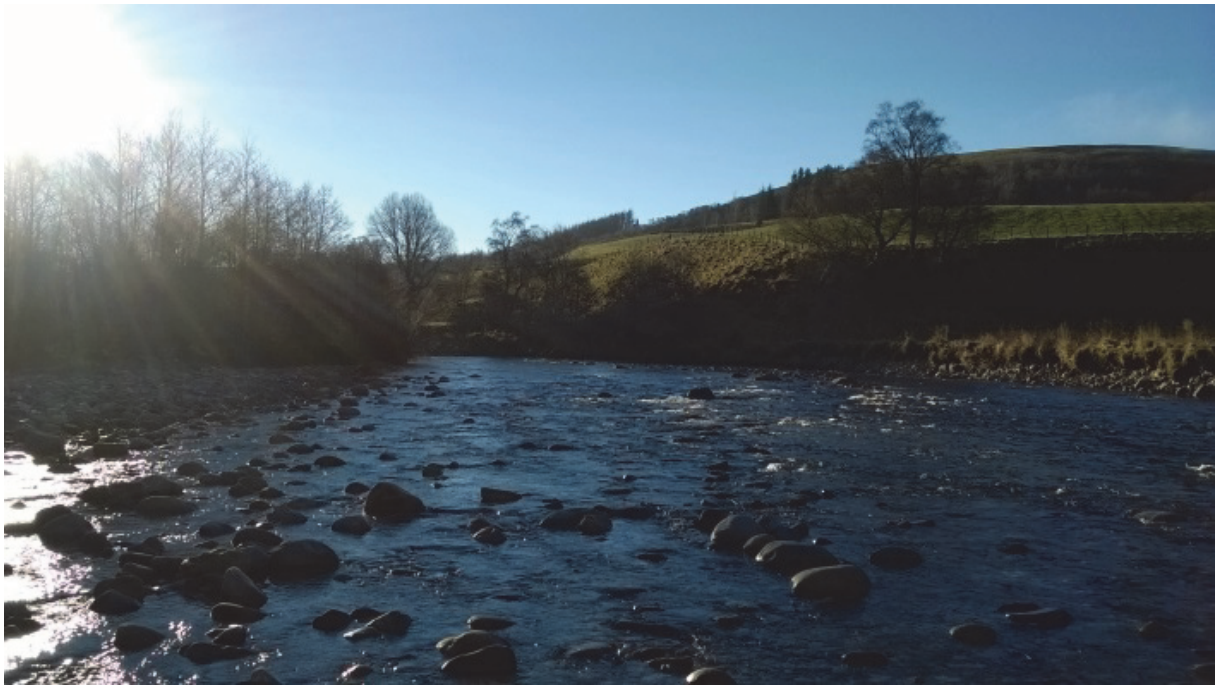
Figure 15. River Avon at Delnabo: top – upstream; bottom – downstream

Table 18. Species collected from River Avon at Delnabo

Order	Family	Species
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Caenidae	*Caenis rivulorum*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Capniidae	*Zwicknia bifrons*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Leuctridae	*Leuctra moselyi*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.2.2 River Avon downstream of Bridge of Avon

Downstream of Bridge of Avon there is evidence of significant recent erosion and deposition with the river having cut in to the downstream right bank during the previous year. The bed here is mostly comprised of cobbles and pebbles with occasional boulders and the flow is moderate to fast.



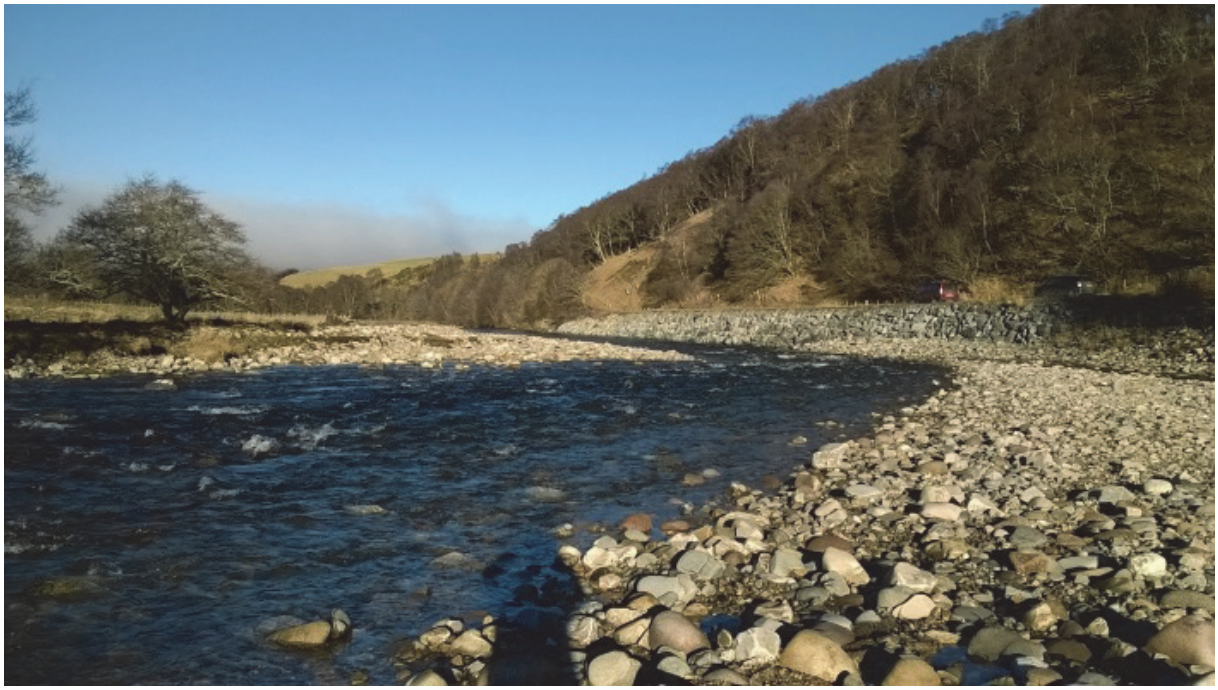


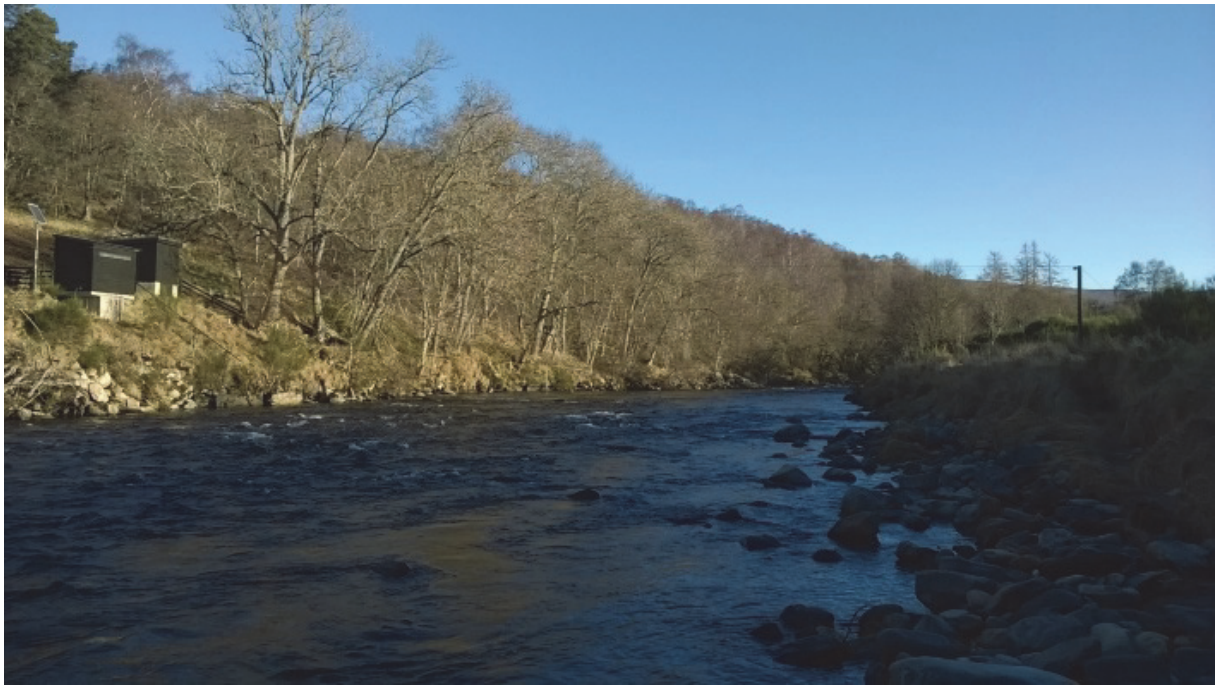
Figure 16. River Avon downstream of Bridge of Avon: top – upstream; bottom – downstream

Table 19. Species collected from River Avon downstream of Bridge of Avon

Order	Family	Species
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.2.3 River Avon at Delnashaugh

The River Avon at Delnashaugh is deep and fast flowing. There are many large boulders on the bed, with small pockets of cobbles, pebbles and gravel. Sampling here was difficult due to the flow and bed conditions and was therefore limited to along the margins of the watercourse.



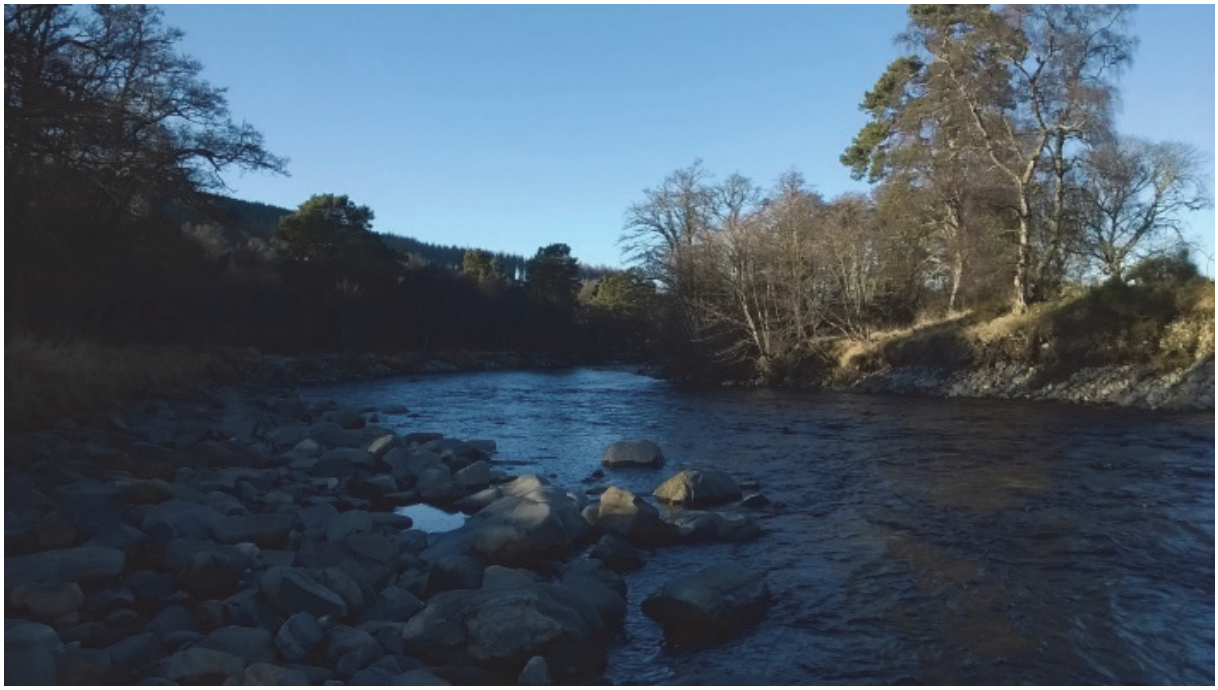


Figure 17. River Avon downstream of Delnashaugh: top – upstream; bottom – downstream

Table 20. Species collected from River Avon downstream of Delnashaugh

Order	Family	Species
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Ameletidae	*Ameletus inopinatus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.
Ephemeroptera	Heptageniidae	*Ecdyonurus venosus*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlodidae	*Isoperla grammatica*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Polycentropidae	*Polycentropus flavomaculatus*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.3 Conglass Water

This tributary of the River Avon flows north westerly from the high ground close to the Lecht Ski Area. A single sample was collected at the Well of Lecht. The watercourse here is 1 to 1.5 metres wide and the bed is composed of pebbles, gravel and sand.

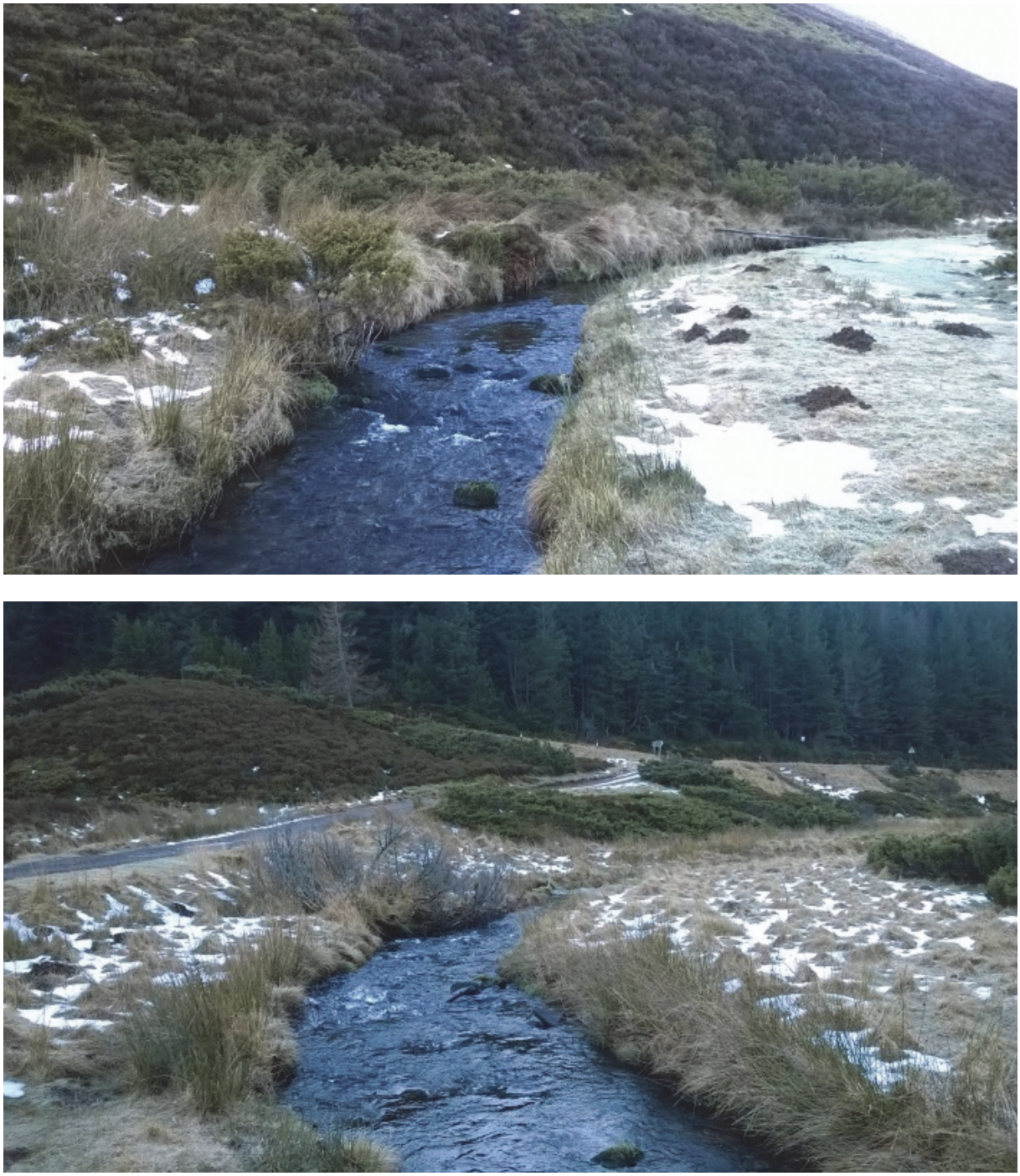


Figure 18. Conglass Water at Well of Lecht: top – upstream; bottom – downstream

Table 21. Species collected from Conglass Water at Well of Lecht

Order	**Family**	**Species**
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Ameletidae	*Ameletus inopinatus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Plecoptera	Capniidae	*Zwicknia bifrons*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlodidae	*Diura bicaudata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.4 River Luineag

The River Luineag flows westwards from Loch Morlich to join the River Druie at Coylumbridge. Samples were taken below the outflow of Loch Morlich and at Badaguish, approximately midway between Loch Morlich and the River Druie downstream.

3.3.4.1 River Luineag at Loch Morlich

The bed downstream of Loch Morlich was comprised of larger cobbles and pebbles with the flow relatively laminar and highly dependent on the outflow from the Loch. The banksides were wooded but a moderate amount of sunlight was reaching the water surface.

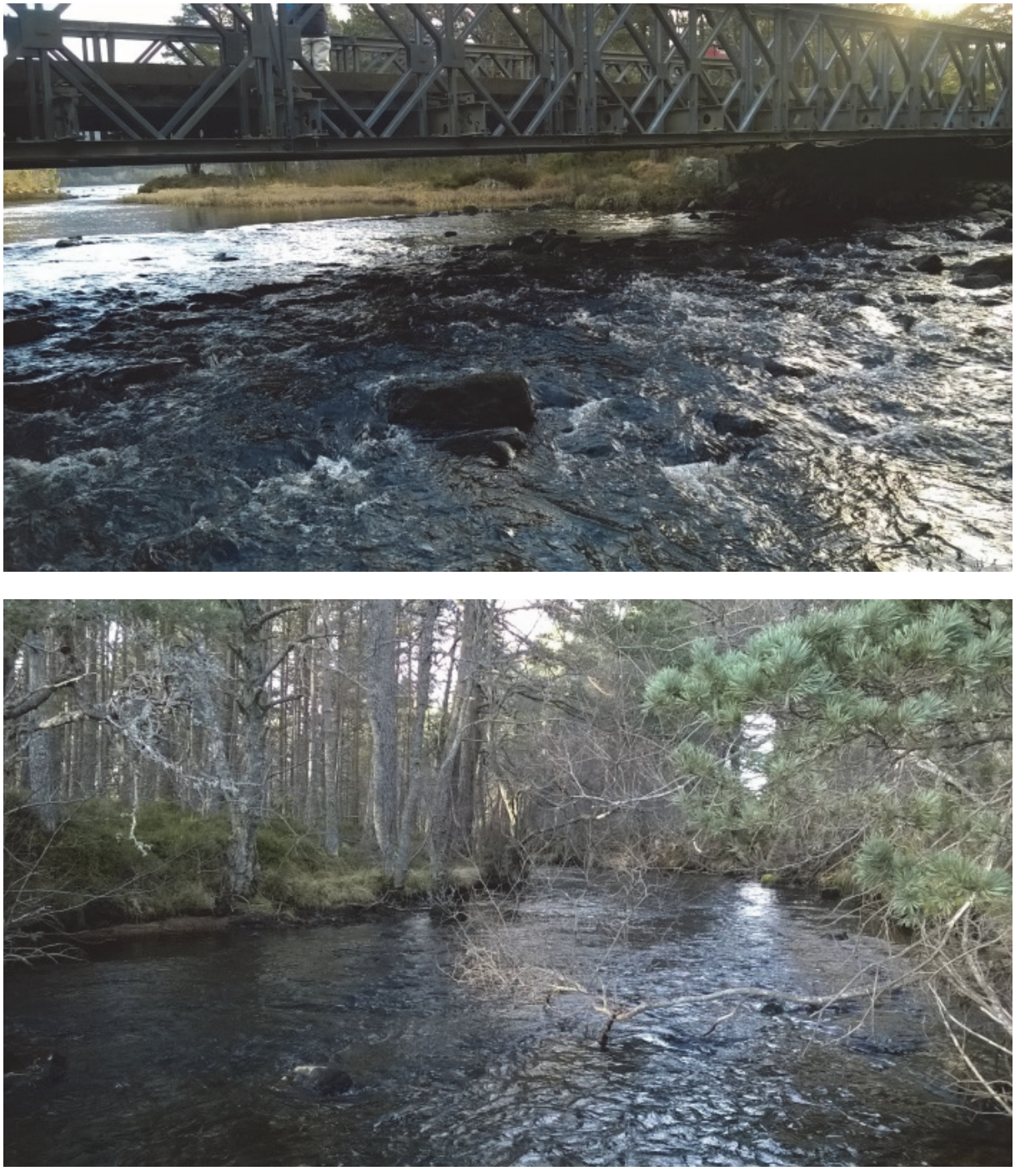


Figure 19. River Luineag at Loch Morlich: top – upstream; bottom – downstream

Table 22. Species collected from River Luineag at Loch Morlich

Order	Family	Species
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*
Ephemeroptera	Leptophlebiidae	*Leptophlebia marginata*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Trichoptera	Polycentropidae	*Neureclipsis bimaculata*

3.3.4.2 River Luineag at Badaguish

In contrast to the site at Loch Morlich upstream, the site at Badaguish was heavily shaded by conifers. The flow here was faster and more turbulent, with the bed comprised of larger cobbles and boulders.

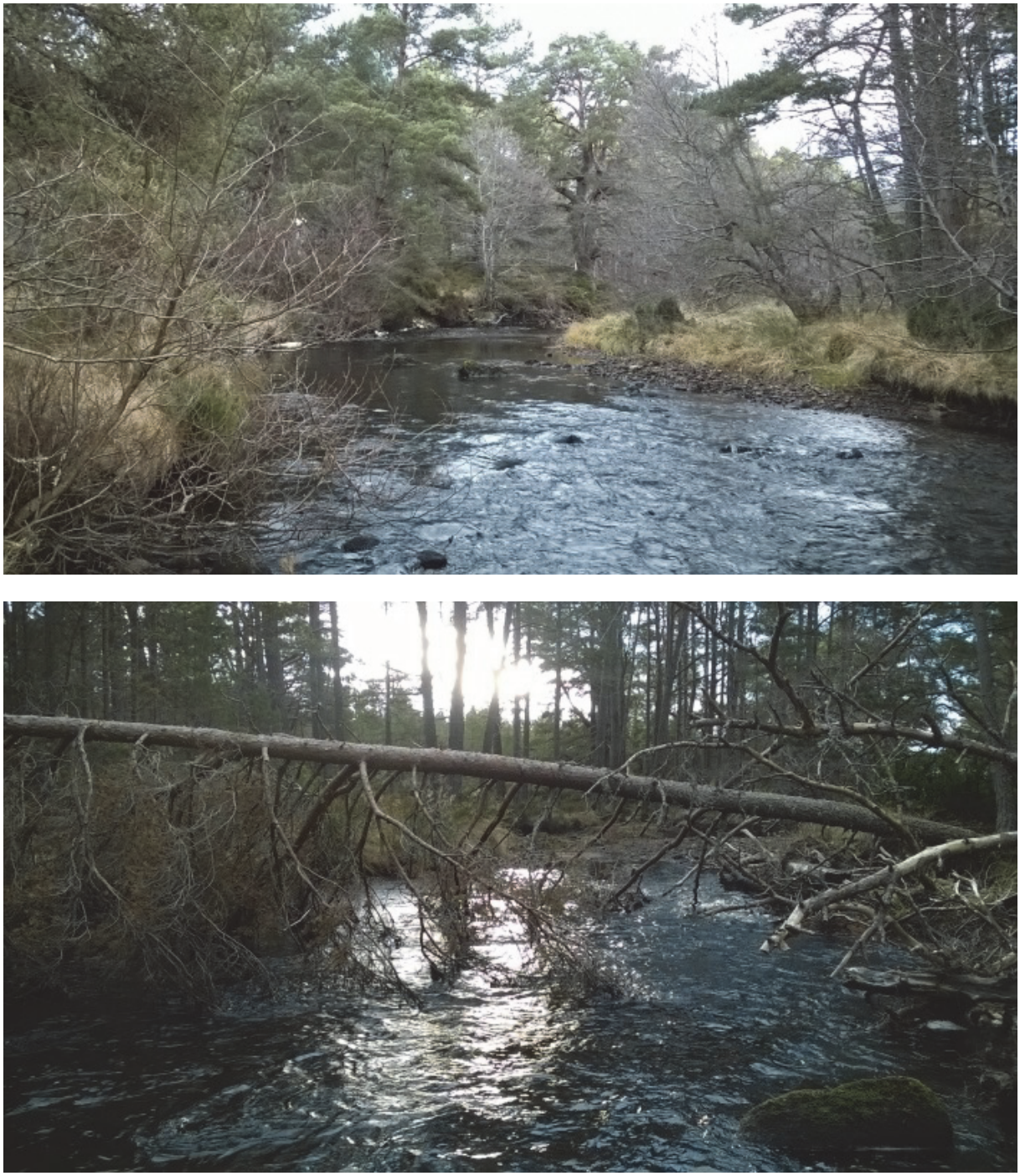


Figure 20. River Luineag at Badaguish: top – upstream; bottom – downstream

Table 23. Species collected from River Luineag at Badaguish

Order	Family	Species
Diptera	Chironomidae	Chironomidae
Ephemeroptera	Baetidae	*Baetis muticus*
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Ecdyonurus* sp.
Ephemeroptera	Heptageniidae	*Heptagenia sulphurea*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*

3.3.5 River Druie

The River Druie flows north-westerly and joins the River Spey at Aviemore. Two samples were collected from the River Druie: at Coylumbridge and at Inverdruie.

3.3.5.1 River Druie at Coylumbridge

The upper sampling site was adjacent to the campsite at Coylumbridge. The watercourse here is fast flowing and the substrate comprises large boulders with pockets of pebbles and gravel. The channel is heavily shaded by pine woodland and little light reaches the water surface.

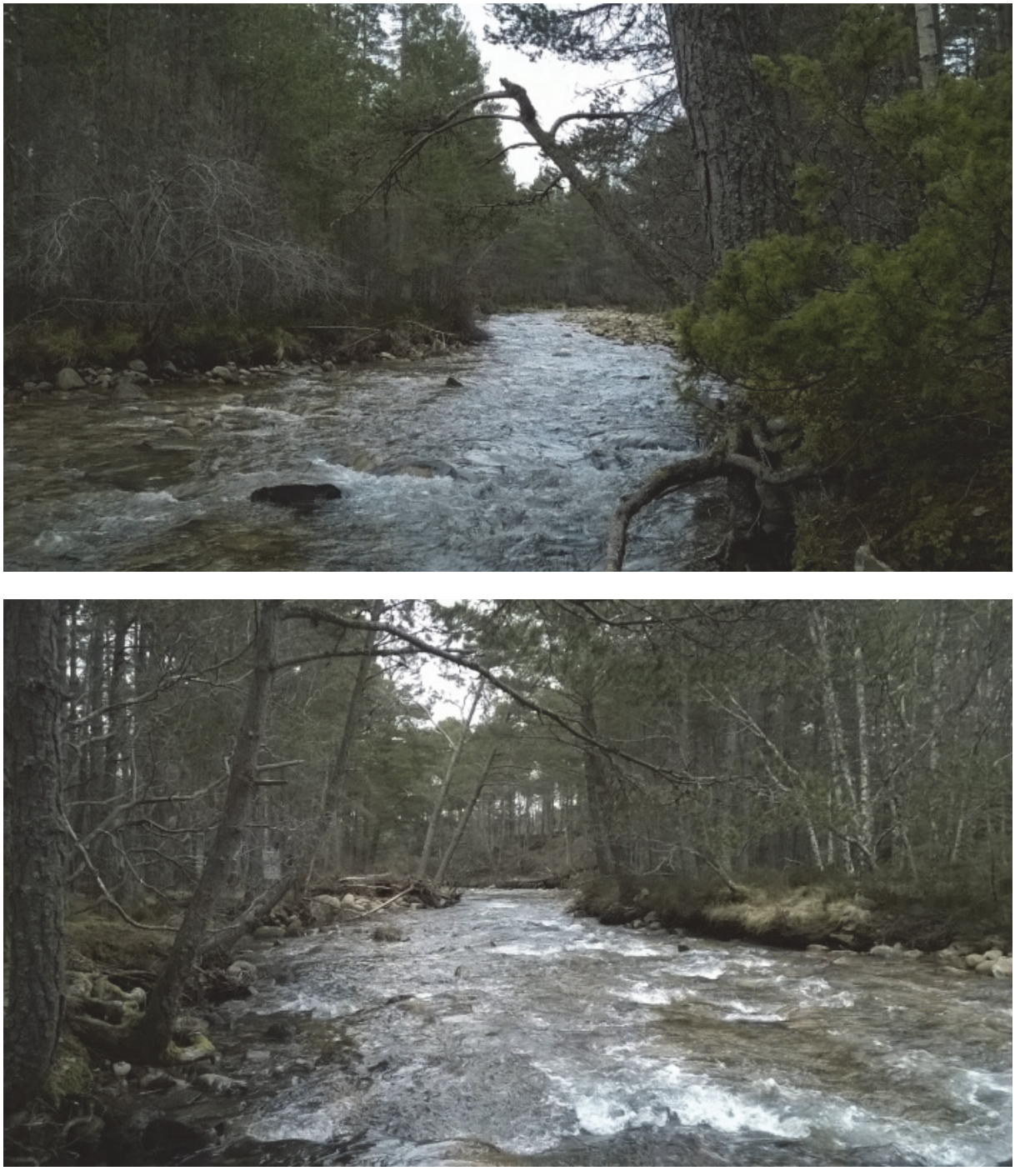


Figure 21. River Druie at Coylumbridge: top – upstream; bottom – downstream

Table 24. Species collected from River Druie at Coylumbridge

Order	Family	Species
Coleoptera	Elmidae	Elmidae
Coleoptera	Gyrinidae	Gyrinidae
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlodidae	*Perlodes mortoni*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Philopotamidae	*Philopotamus montanus*
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.5.2 River Druie at Inverdruie

The lower sampling site at Inverdruie has a more open aspect and the bed is composed of cobbles and larger pebbles with the occasional boulder.

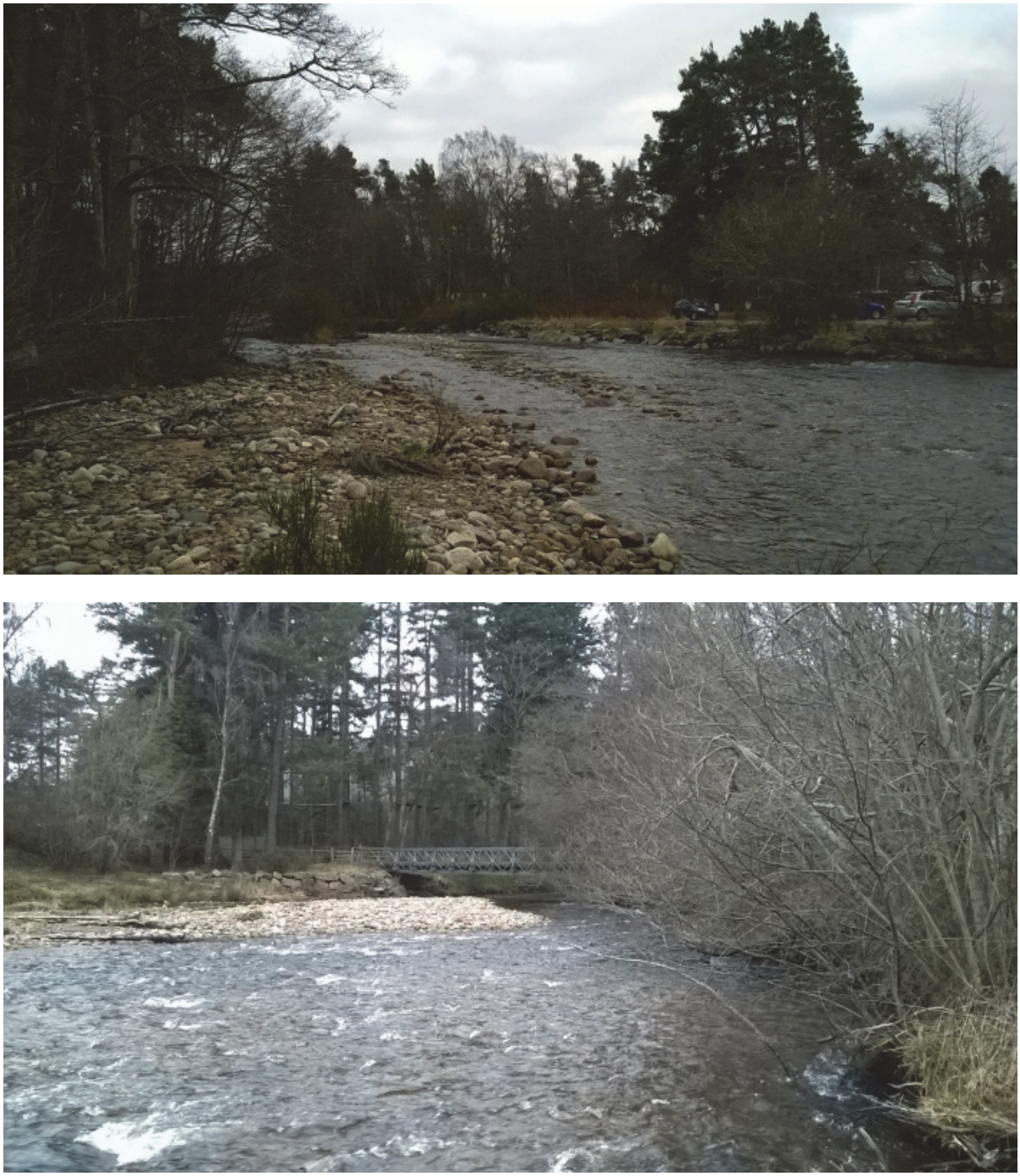


Figure 22. River Druie at Inverdruie: top – upstream; bottom – downstream

Table 25. Species collected from River Druie at Inverdruie

Order	Family	Species
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.3.6 River Feshie

This north-flowing watercourse joins the River Spey at downstream of Kincraig. The river is extremely active and has formed extensive braided channels in its middle reaches. Two samples were taken from the River Feshie: in Glenfeshie; and at Feshiebridge.

3.3.6.1 River Feshie at Glen Feshie

The flow at the upper sample location in Glenfeshie was fast, with the bed comprised of larger pebbles, cobbles and small boulders.

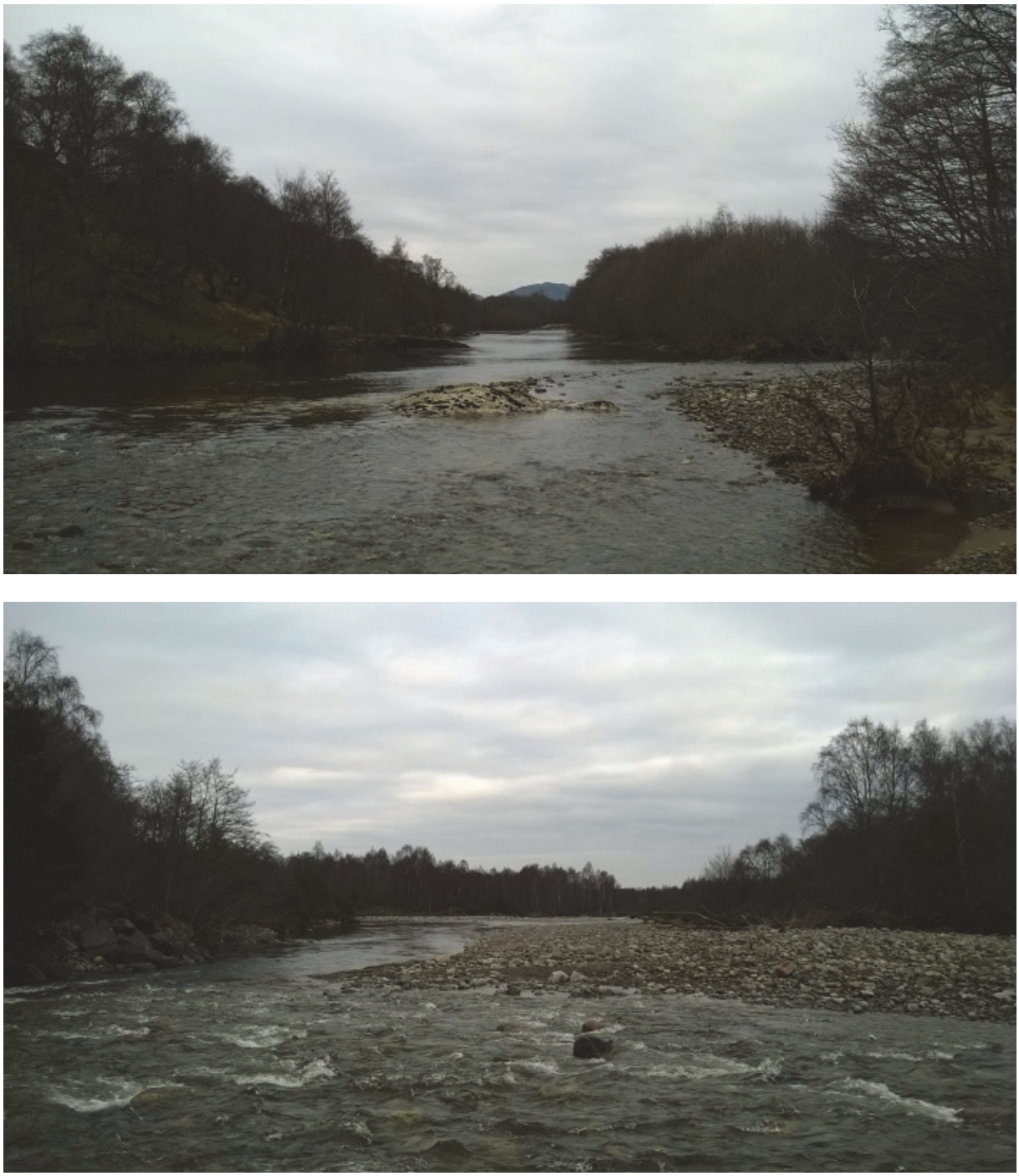


Figure 23. River Feshie at Glen Feshie: top – upstream; bottom – downstream

Table 26. Species collected from River Feshie at Glen Feshie

Order	Family	Species
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Leuctridae	*Leuctra moselyi*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.

3.3.6.2 River Feshie at Feshiebridge

At the lower site in Feshiebridge the river flows through a wider, non-braided channel with the bed composed of pebbles and cobbles. In faster flowing areas these cobbles were larger and there were occasional boulders.

Figure 24. River Feshie at Feshiebridge: top – upstream; bottom – downstream

Table 27. Species collected from River Feshie at Feshiebridge

Order	**Family**	**Species**
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Amphinemura sulcicollis*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*
Trichoptera	Hydropsychidae	*Hydropsyche* sp.

3.4 River Tay Catchment

3.4.1 Allt a' Ghlinn Beag

This south-flowing watercourse is a tributary of the Shee water located in the River Tay catchment. A single sample was taken from the watercourse upstream of its confluence with the Shee Water. The channel here is well defined with a classic riffle-pool-glide flow structure. The bed is comprised of smaller cobbles and pebbles with sand and gravel in slower sections.

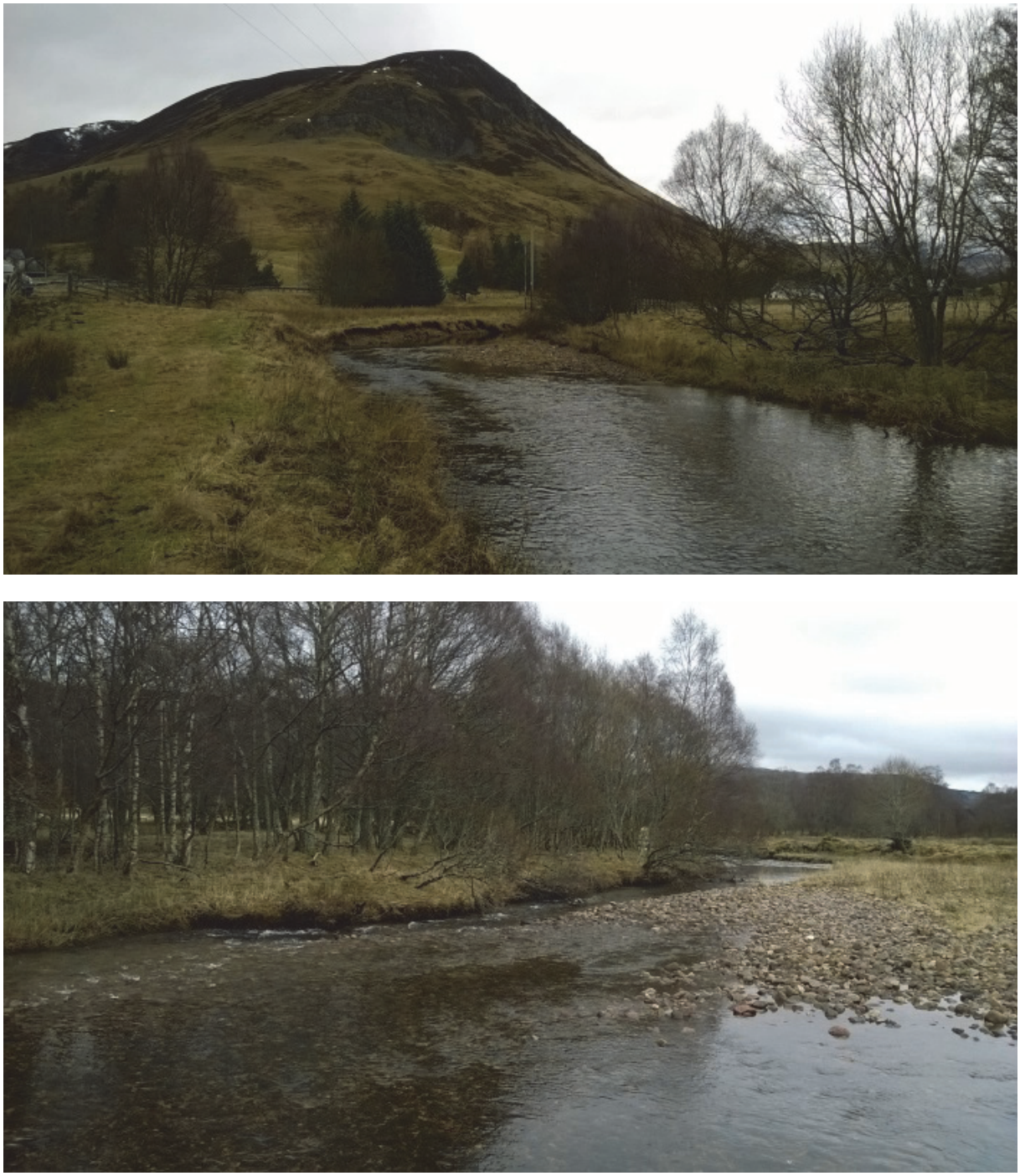


Figure 25. Allt a' Ghlinn Beag at Spittal of Glenshee: top – upstream; bottom – downstream

Table 28. Species collected from Allt a' Ghlinn Beag at Spittal of Glenshee

Order	Family	Species
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Baetidae	*Baetis* sp.
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Capniidae	*Zwicknia bifrons*
Plecoptera	Chloroperlidae	*Siphonoperla torrentium*
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Perlodidae	*Perlodes mortoni*
Trichoptera	Limnephilidae	Limnephilidae
Trichoptera	Rhyacophilidae	*Rhyacophila* sp.

3.4.2 Shee Water

The Shee Water flows south, becoming the Black Water before joining the River Ericht upstream of Blairgowrie. A single sample was taken from this watercourse at the Spittal of Glenshee. There was evidence of significant substrate disturbance recently with large banks of cobbles having been deposited across the immediate flood plain of the river. This is in contrast with the nearby Allt a'Ghlinn Beag which appears to have a much more stable flow regime.

Figure 26. Shee Water at Spittal of Glenshee: top – upstream; bottom – downstream

Table 29. Species collected from Shee Water at Spittal of Glenshee

Order	Family	Species
Diptera	Chironomidae	Chironomidae
Diptera	Simuliidae	Simuliidae
Ephemeroptera	Baetidae	*Baetis rhodani*
Ephemeroptera	Baetidae	*Baetis* sp.
Ephemeroptera	Heptageniidae	*Electrogena lateralis*
Ephemeroptera	Heptageniidae	*Rhithrogena* sp.
Plecoptera	Leuctridae	*Leuctra hippopus*
Plecoptera	Leuctridae	*Leuctra inermis*
Plecoptera	Nemouridae	*Protonemura meyeri*
Plecoptera	Nemouridae	*Protonemura praecox*
Plecoptera	Perlidae	*Perla bipunctata*
Plecoptera	Perlodidae	*Isoperla grammatica*
Plecoptera	Taeniopterygidae	*Brachyptera risi*

4. DISCUSSION

4.1 Distribution

The objective of these surveys was to determine whether *Brachyptera putata* is present in smaller watercourses in the Cairngorms National Park. Five tributaries of the River Spey, four tributaries of the River Dee and two tributaries of the River Tay were explored. In addition, the upper River Don and the main River Spey was also surveyed. *Brachyptera putata* was only present in the main River Spey. Small specimens of *B. risi* were found in most of the other watercourses. From these results, and previous records from the River Dee, it would suggest that *Brachyptera putata* is restricted to the middle to lower reaches on the main stem of rivers in the Cairngorms National Park.

At the end of December 2015 the Cairngorms were hit by Storm Frank, a weather system that brought an extended period of heavy rain and strong winds. The storm led to some of the worst flooding recorded on the River Dee resulting in extensive changes to the river channel and banks. The River Spey catchment also suffered damage due to increased flows, however, this was more localised than the extensive damage on the Dee. The impact of the extreme flow events in the River Dee on *Brachyptera putata* is unknown, however, it is likely that there will have been changes to the distribution of this species. Further survey effort is required to determine the status of the population of *B. putata* in the River Dee. Similarly, it is not known whether this species occurs in the River Tay or South Esk catchment within the Park. It is recommended that a survey is undertaken on the main River Dee, the River Tay catchment above Pitlochry and the River South Esk catchment to further investigate the current distribution and status of *B. putata* in the Cairngorms National Park.

Further afield, it is over 15 years since the last comprehensive survey of the distribution of *Brachyptera putata*. Consideration should be given to a repeat of the national survey undertaken in 2001 to understand the current distribution of this endemic species.

4.2 Natural history

During the course of the present surveys a number of useful observations were made on the natural history of *Brachyptera putata*. The importance of winter sunlight reported by Hammett (2002) was confirmed. Adults where found 'basking' on bankside fenceposts along the River Spey at Boat of Garten and Grantown-on-Spey. After completion of these surveys a group of volunteers continued to record adult *B.putata* by examining fenceposts in sunlight. A single adult female was recorded from the River Dee at Balmoral. Further afield a record of an adult female was reported from the River Conon near Marybank using the same technique of examining fenceposts in sunlight. This sighting represents the first record of this species from the Conon.

Further adult records of this species were subsequently made from the River Spey at An Camus Mor, Boat of Garten, Cromdale and Broomhill Bridge; and the rivers Tromie and Dulnain near their confluence with the River Spey. The latter records close to the confluence with the Spey related to females and may represent adult dispersal from the main river rather than a population being present in the tributaries. An adult female was found at An Camus Mor on the 17th March 2017 at a distance of 185 metres perpendicular to the river suggesting that dispersal, at least in the females, is relatively good (Gus Jones, pers. comm.).

Pryce (2010) reported that males of *Brachyptera putata* are reluctant, perhaps unable, to fly due to brachypterous wings. This was evident during the present surveys, however males were found on fenceposts along the River Spey at Boat of Garten and Grantown-on-Spey at distances of approximately 17 metres and 42 metres from the river. It is hard to believe that the adult males walked from the river to these locations.

Further observations were made on the behaviour of the adults. Several individuals of *Brachyptera putata* were observed scraping the surface of fenceposts with their mouthparts (Stewart Taylor, pers. comm.). Tierno de Figueroa and Fochetti (2001) reported that *B. risi* adults examined did not contain any gut contents, however a single adult female of *B. calabrica* contained spores and hyphae of Ascomycetes, together with a small quantity of plant remains and pollen grains. It seems likely that *B. putata* is feeding upon algae and lichen growing on the surface of the fenceposts.

These surveys also provided useful information on the emergence behaviour of *Brachyptera putata* nymphs. Exuviae of *B. putata* males were found attached to the underside of the bridge over the River Spey at Kingussie. The exuviae were located approximately 2.5 to 3 metres above the water level. A nymph of *B. putata* was subsequently observed climbing an alder tree at the side of the River Spey at An Camus Mor at 12:35am. It is assumed that this nymph was looking for a site for metamorphosis to the adult stage. At the time of the observation it had reached a height of approximately 2 metres (Gus Jones, pers. comm.).

It is clear that looking for adult *Brachyptera putata* on bankside fenceposts is a useful survey technique. It is recommended that a public survey for this species is developed, including a postcard-sized identification guide, to target anglers, ghillies, fishery trust employees and local residents along rivers in the Highlands. The information gathered could help to identify previously unknown watercourses where *B. putata* is present.

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