Reference Condition Descriptions for Northern Ireland River Types

River Type: Low altitude (<200m), small catchment size (10-100km^2), organic; Northern Ireland type 9.

Garvary River County Fermanagh

Type Overview: In Northern Ireland, this river type is found in parts of North Antrim and in Counties Tyrone, Fermanagh and Londonderry.

Examples of rivers at or near reference conditions falling into this category are tributaries of the Owenreagh River and River Blackwater, Co Tyrone, and the Garvary River, Co Fermanagh.

Morphology: These small, low altitude streams may be subject to peat deposition washed down in high flows so that the deeper, slow flowing areas may be covered in fine particulate peat while faster flowing areas may have a sand, gravel or cobble substrate. Flows likely to be associated with runs and glides.

Hydrology: Organic catchments are generally saturated, with a low base flow index. They therefore respond more quickly to rainfall events. Less rainfall is experienced at lower elevations. Catchments at lower elevations can therefore be expected to show smaller discharges per unit catchment area. Smaller catchments show a quick hydrological response to rainfall. The hydrograph time-to-peak and return to base flow will therefore be relatively short.

Physico-chemistry: Alkalinity very low.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel), *Noemachellus barbatulus* (stone loach), *Phoxinus phoxinus* (minnow) and *Gasterosteus aculeatus* (three spine stickleback).

Macrophytes: Limited species in this type in Northern Ireland mostly consisting of liverworts, including *Scapania undulata, Chiloscyphus polyanthos* and *Pellia epiphylla,* and mosses *Hyocomium armoricum, Plagiomnium rostratum* and *Rhynchostegium riparioides.* The few higher plants found include *Callitriche* spp. and *Caltha palustris.*

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Macroinvertebrates: Families encountered include leeches, the freshwater limpet, Ancylidae, and molluscs such as Lymnaeidae. Mayfly families may include Baetidae,

Caenidae, Ephemerellidae and Heptageniidae. Stonefly species can include members of the Leutridae, Chloroperlidae and Perlodidae families. Caddis larvae are likely to be well represented by members of the families Hydropsychidae, Polycentropidae, Rhyacophilidae, Limnephilidae, Hydroptilidae and Goeridae.

River Type: Medium altitude (200 to 800m), small catchment (10 to 100 km^2), siliceous; Northern Ireland type 5.

Shimna River County Down

Type Overview: In Northern Ireland this type is found mainly in parts of North Antrim, South Down, Co Tyrone and Co Londonderry.

Examples of rivers at or near reference conditions falling into this category are parts of the Glenelly River, the Shimna River and the upper reaches of the Upper Bann and River Faughan.

Morphology: This type is likely to be eroding in the upper reaches and depositional in the lower reaches. Flow types will range from turbulent in the upper reaches, with runs, glides, riffles and pools further downstream. Substrate ranges from silt, sand and gravel to cobbles and boulders and bedrock.

Hydrology: Siliceous catchments are more likely to have a lower base flow index. The hydrological regime is therefore more likely to have less connectivity with groundwater and to exhibit a faster hydrological response to rainfall events. Rainfall is greater at higher elevations. Catchments at higher elevations can therefore be expected to show increased discharges per unit catchment area. Smaller catchments show a quick hydrological response to rainfall. The hydrograph time-to-peak and return to base flow will therefore be relatively short.

Physico-chemistry: Low alkalinity.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel) and *Noemachellus barbatulus* (stone loach).

Macrophytes: Bryophytes dominate in this type, including *Scapania undulata, Conocephalum conicum, Marchantia polymorpha, Solenostoma triste, Calliergon cuspidatum, Cinclidotus fontinaloides, Dichodontium pellucidum, Racomitrium* spp, *Rhynchostegium riparioides* and *Fontinalis squamosa*. Higher plants may include *Myosotis scorpioides, Tussilago farfara* and *Stachys palustris*.

Macroinvertebrates: Various families may be encountered including leeches, Simulidae and the freshwater limpet, Ancylidae. Mayfly families may include Baetidae, Ephemerellidae, Heptageniidae and Caenidae. Stoneflies encountered may include members of the Nemouridae, Chloroperlidae and Perlodidae families. Caddis

larvae are well represented by members of the families Hydropsychidae, Polycentropidae, Rhyacophilidae and Limnephilidae.

River Type: Medium altitude (200 to 800m), small catchment (10 to 100 km^2), calcareous; Northern Ireland type 13.

River Bush County Antrim

Type Overview: Examples of this type in Northern Ireland are found in Counties Antrim, Fermanagh, Tyrone and Londonderry.

Examples of rivers at or near reference conditions falling into this category are parts of the River Bush, the Glens of Antrim rivers, tributaries of the River Main and the Sillees River.

Morphology: Small to medium size rivers. The flow will vary from turbulent and fairly fast in some places to slow in others, while the substrate can range from fine sand and silt to gravel or cobbles. This type will have riffles, runs and some pools associated with it; the slower flowing downstream sections being largely depositional and the more turbulent upper sections eroding.

Hydrology: Calcareous catchments are more likely to have a higher base flow index. The hydrological regime is therefore more likely to have greater connectivity with groundwater and to exhibit a delayed and subdued hydrological response to rainfall events. Greater rainfall is experienced at higher elevations. Catchments at higher elevations can therefore be expected to show increased discharges per unit catchment area. Smaller catchments show a quick hydrological response to rainfall. The hydrograph time-to-peak and return to base flow will therefore be relatively short.

Physico-chemistry High alkalinity

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Esox lucius* (pike), Rutilus rutilus (roach), *Phoxinus phoxinus* (minnow) and *Gasterosteus aculeatus* (three spine stickleback).

Macrophytes: Higher plants are fairly limited with *Oenanthe crocata* being the most common species. Liverworts include *Conocephalum conicum, Chiloscyphus polyanthos, Marchantia polymorpha, Solenstoma triste* and *Pellia endiviifolia*. Bryophytes dominate and include *Blindia acuta, Dichodontium pellucidum, Rhynchostegium riparioides, Cinclidotus fontinaloides, Fontinalis antipyretica* and *Schistidium alpicola*.

Macroinvertebrates: Caddis flies are well represented by Hydropsychidae, Limnephilidae, Polycentropodidae and Rhyacophilidae. Mayflies include the families Caenidae, Ephemerellidae and Heptageniidae. Stonefly families found are Nemouridae, Chloroperlidae, Perlidae, Perlodidae and Leuctridae.

River Type: Medium altitude (200 to 800m), small catchment (10 to 100 km^2), organic; Northern Ireland type 33.

Cassy Water County Down

Type Overview: In Northern Ireland this type is found mainly in parts of North Antrim, South Down, Co Tyrone and Co Fermanagh.

Examples of rivers at or near reference conditions falling into this category are parts of the Owenkillew River, the River Roe, the Glenshesk River. the Annalong and Cassy Water Rivers.

Morphology: Small to medium size, medium altitude streams flowing through peat. Lower reaches will be depositional with the deeper, slow flowing areas possibly covered in fine particulate peat, while faster flowing areas may have a sand, gravel or cobble. Upper reaches will be eroding in nature.

Hydrology: Organic catchments are generally saturated, with a low base flow index. They therefore respond quickly to rainfall events. Greater rainfall is experienced at higher elevations. Catchments at higher elevations can therefore be expected to show increased discharges per unit catchment area. Smaller catchments show a quick hydrological response to rainfall. The hydrograph time-to-peak and return to base flow will therefore be relatively short.

Physico-chemistry: Alkalinity low.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel), *Rutilus rutilus* (roach), *Noemachellus barbatulus* (stone loach) and *Phoxinus phoxinus* (minnow).

Macrophytes: This type is dominated by liverworts and mosses, including *Chiloscyphus polyanthos, Conocephalum conicum, Lunularia cruciata, Marchantia polymorpha, Scapania undulatum, Brachythecium plumosum, Brachythecium rivulare, Calliergon cuspidatum, Fontinalis antipyretica* and *Rhynchostegium riparioides.*

Macroinvertebrates: Families encountered include leeches, Simulidae and the freshwater limpet, Ancylidae. Mayfly species may include Baetidae, Ephemerellidae and Heptageniidae. Stoneflies found are Nemouridae, Leuctridae, Chloroperlidae and Perlodidae. Caddis larvae are well represented by members of the families

Hydropsychidae, Polycentropidae, Rhyacophilidae, Limnephilidae, Hydroptilidae and Leptoceridae.

River Type: Medium altitude (200 to 800m), medium catchment (>100 to 1000 km^2), siliceous; Northern Ireland type 6.

Tullynadall Burn County Tyrone

Type Overview: In Northern Ireland, this type is found only in part of the Glenelly River system.

The only example of a river at or near reference conditions falling into this category is Tullynadall Burn, a tributary of the Glenelly River.

Morphology: Generally lower or middle reaches of medium sized rivers in upland areas. Likely to be depositional , with runs and riffles; substrates ranging from sand and gravel to cobbles and boulders.

Hydrology: Siliceous catchments are more likely to have a lower base flow index. The hydrological regime is thus more likely to have a less connectivity with groundwater and to respond more quickly to rainfall events. Greater rainfall is experienced at higher elevations. Catchments at higher elevations can therefore be expected to show increased discharges per unit catchment area. The larger upstream area of medium sized catchments reduces the speed of the hydrological response to rainfall. This lengthens the hydrograph time-to-peak and slows the return back to base flow.

Physico-chemistry: Low alkalinity

Fish: Glenelly River has been sampled by the NI Fish in Rivers Project during summer 2004; results are pending.

Macrophytes: Bryophytes dominate, including *Brachythecium rivulare, Fontinalis antipyretica*, *Racomitrium* spp., *Thamnobryum alopecurum, Amblystegium fluviatile* and *Cinclidotus fontinaloides.* The liverwort *Scapania undulata* also occurs..

Macroinvertebrates: Various families may be encountered, including leeches, Simulidae and the freshwater limpet, Ancylidae. Stoneflies encountered include Leuctridae, Chloroperlidae and Perlodidae. Caddis larvae are represented by members of the families Hydropsychidae, Rhyacophilidae, Limnephilidae, Leptoceridae and Lepidostomatidae.

River Type: Medium altitude (200 to 800m), medium catchment (>100 to 1000 km^2), organic; Northern Ireland type 34.

Owenkillew River County Tyrone

Type Overview: In Northern Ireland this type is found only in part of the Owenkillew River in the Sperrins.

Morphology: Medium size river found only in the Sperrins flowing through peat. Lower reaches may be subject to peat deposition washed down in high flows so that the deeper, slow flowing areas may be covered in fine particulate peat while faster flowing areas may have a sand, gravel or cobble substrate. Upper reaches will be eroding in nature.

Hydrology: Organic catchments are generally saturated, with a low base flow index. They therefore respond quickly to rainfall events. Greater rainfall is experienced at higher elevations. Catchments at higher elevations can therefore be expected to show increased discharges per unit catchment area. The larger upstream area of medium sized catchments reduces the speed of the hydrological response to rainfall. This lengthens the hydrograph time-to-peak and slows the return back to base flow.

Physico-chemistry: Mixed alkalinity values.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel) and *Phoxinus phoxinus* (minnow).

Macrophytes: Bryophytes dominate including *Brachythecium rivulare, Fontinalis antipyretica*, *Racomitrium* spp., *Amblystegium fluviatile* and *Cinclidotus fontinaloides.* The liverwort *Scapania undulata* also occurs.

Macroinvertebrates: Various families may be encountered, including leeches, Simulidae and the freshwater limpet, Ancylidae and molluscs such as Lymnaea. Mayfly families include Baetidae, Ephemerellidae, Heptageniidae and Caenidae. Stoneflies encountered may include Leuctridae, Taeniopterygidae and Chloroperlidae. Caddis larvae are represented by members of the families Hydropsychidae, Rhyacophilidae, Limnephilidae, Lepidostomatidae and Leptoceridae.

River Type: Medium altitude (200 to 800m), medium catchment (>100 to 1000 km^2), calcareous; Northern Ireland type 14.

River Roe County Londonderry

Type Overview: In Northern Ireland this type is found in parts of Co Antrim and Co Londonderry.

Examples of a river at or near reference conditions falling into this category are parts of the Owenbeg River, a tributary of the River Roe.

Morphology: This type consists of medium sized rivers. The flow will vary from turbulent and fast in some places to slow in others, while the substrate is likely to be fairly mixed. This type will have glides and riffles with some pools. The slow flowing, downstream sections will be depositional, while the more turbulent, upper sections will be eroding.

Hydrology: Calcareous catchments are more likely to have a higher base flow index. The hydrological regime is thus more likely to have greater connectivity with groundwater and to respond slowly to rainfall events. Greater rainfall is experienced at higher elevations. Catchments at higher elevations can therefore be expected to show increased discharges per unit catchment area. The larger upstream area of medium sized catchments reduces the speed of the hydrological response to rainfall. This lengthens the hydrograph time-to-peak and slows the return to base flow.

Physico-chemistry: Mixed alkalinity values.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel) and *Noemachellus barbatulus* (stone loach).

Macrophytes: The macrophyte community of this type consists mainly of mosses particularly *Rhynchostegium riparioides* and also *Dichodontium pellucidum* and *Fontinalis squamosa*. Higher plants include *Sparganium erectum* and *Eleocharis palustre*.

Macroinvertebrates: A number of snail families are found here including Lymnaeidae, Valvatidae and Ancylidae. Mayflies are represented by Baetidae, Caenidae, Leptophlebidae, Ephemerellidae and Heptageniidae. Stoneflies are represented by Leutridae and Chloroperlidae. A number of caddis fly families are

found, including, Limnephilidae, Hydropsychidae, Rhyacophilidae and Sericostomatidae.

River Type: Low altitude (<200m), small catchment (10 to 100 km^2), calcareous; Northern Ireland type 17.

Crumlin River County Antrim

Type Overview: There is extensive coverage of this type in Northern Ireland extending from Co Fermanagh and across Co Londonderry, Co Tyrone, Co Antrim and parts of Co Armagh.

Examples of rivers at or near reference conditions falling into this category are parts of the Sillees and Roogagh Rivers, the Owenreagh River, the Larne Rivers, the Six Mile Water and the Glenavy River.

Morphology: Small, low altitude rivers with slow flowing areas depositional in nature. This type will have deep glides and riffles associated with it, with the substrate ranging from silt, sand and gravel to cobble and boulder.

Hydrology: Calcareous catchments are more likely to have a higher base flow index. The hydrological regime is therefore more likely to have greater connectivity with groundwater and to respond slowly to rainfall events. Less rainfall is experienced at lower elevations. Catchments at lower elevations can therefore be expected to show smaller discharges per unit catchment area. Smaller catchments show a quick hydrological response to rainfall. The hydrograph time-to-peak and return to base flow will therefore be relatively short.

Physico-chemistry: High alkalinity

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel), *Noemachellus barbatulus* (stone loach), *Phoxinus phoxinus* (minnow) and *Gasterosteus aculeatus* (three spine stickleback).

Macrophytes: The macrophyte community consists of *Callitriche* spp., *Potamogeton natans, Sparganium emersum* and *Sparganium erectum.* Liverworts include *Chiloscyphus polyanthos, Lunularia cruciata*, *Pellia* spp. and *Conocephalum conicum*. *Brachythecium* spp., *Fontinalis antipyretica* and *Rhynchostegium riparioides* are also found.

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Macroinvertebrates: A number of snail families are found here, including Hydrobiidae, Lymnaeidae, Planorbidae and Ancylidae. Caddis fly families found are Hydropsychidae, Limnephilidae, Polycentropodidae, Rhyacophilidae,

Sericostomatidae, Lepidostomatidae, Goeridae and Leptoceridae. Stoneflies include Perlodidae, Leuctridae, Nemouridae and Chloroperlidae. Mayflies are represented by Caenidae, Ephemeridae, Ephemerellidae and Heptageniidae.

River Type: Low altitude (<200m), medium catchment (>100 to 1000 km^2), calcareous; Northern Ireland type 18.

Moyola River County Londonderry

Type Overview: In Northern Ireland, this type is found mainly in parts of North Antrim, Co Tyrone, Co Londonderry and Co Fermanagh.

Examples of rivers at or near reference conditions falling into this category are parts of the Ballinderry, Moyola, Colebrooke, Finn and Blackwater rivers.

Morphology: Medium size rivers at low altitude. The flow will vary from fast in some places to slow in others, with deposition in the slow flowing areas. Likely to be associated with deep riffles and glides with the substrate mixed ranging from sand and gravel to cobble and boulder.

Hydrology: Calcareous catchments are more likely to have a higher base flow index. The hydrological regime is therefore more likely to have greater connectivity with groundwater and to respond slowly to rainfall events. Less rainfall is experienced at lower elevations. Catchments at lower elevations can therefore be expected to show smaller discharges per unit catchment area. The larger upstream areas of medium sized catchments reduce the speed of the hydrological response to rainfall. This lengthens the hydrograph time-to-peak and slows the return to base flow.

Physico-chemistry: Mixed alkalinity values.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Esox lucius* (pike), *Abramis brama* (bream), *Rutilus rutilus* (roach), *Anguilla anguilla* (eel), *Noemachellus barbatulus* (stone loach), *Gobio gobio* (gudgeon), *Lampetra planeri* (river lamprey), *Phoxinus phoxinus* (minnow) and *Gasterosteus aculeatus* (three spine stickleback).

Macrophytes: Macrophytes and bryophytes found in this type in Northern Ireland include Callitriche spp., *Ranunuculus penicillatus* var. *penicillatus, Conocephalum conicum*, *Pellia* spp., *Fontinalis* spp. and *Brachythecium* spp.

Macroinvertebrates: Invertebrates found in this type include families of snails such as Planorbidae, Lymnaeidae, Hydrobiidae and the freshwater limpet, Ancylidae. Caddis flies include Limnephilidae, Rhyacophilidae, Lepidostomatidae and Leptoceridae. Mayflies found include Caenidae, Ephemerellidae and Heptageniidae,

and stoneflies are represented by Chloroperlidae, Perlodidae, Leutridae and Taeniopterygidae families. Astacidae and Unionidae can be found at sites in this type at or near reference conditions.

River Type: Low altitude (<200m), large catchment (>1000 to 10000 km^2), calcareous; Northern Ireland type 19.

River Strule County Tyrone

Type Overview: In Northern Ireland this type is predominant in the tributaries of Upper and Lower Lough Erne and Lough Neagh, as well as in the Lower Bann and parts of County Tyrone.

The only example of a river in this category at or near reference conditions is the River Strule at Moyle Bridge.

Morphology: These low altitude rivers will be subject to deposition in slow flowing areas. This type will have glides and runs with varying substrate ranging from sand and gravel to cobble and boulder.

Hydrology: Calcareous catchments are more likely to have a higher base flow index. The hydrological regime is therefore more likely to have greater degree connectivity with groundwater and to respond slowly to rainfall events. Less rainfall is experienced at lower elevations. Catchments at lower elevations can therefore be expected to show smaller discharges per unit catchment area. Large catchments show a slow hydrological response to rainfall. This causes a long time-to-peak and a slow return to base flow conditions.

Physico-chemistry: Mixed alkalinity values.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel), *Noemachellus barbatulus* (stone loach), *Phoxinus phoxinus* (minnow) and *Gasterosteus aculeatus* (three spine stickleback).

Macrophytes: Bryophytes include *Fontinalis antipyretica, Fontinalis squamosa, Rhynochostegium riparoides* and higher plants are represented by *Ranunculus penicillatus* and *Oenanthe crocata.*

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Macroinvertebrates: Caddis flies found here include Hydropsychidae, Limnephilidae, Rhyacophilidae, Psychomidae, Sericostomatidae, Lepidostomatidae, Goeridae and Leptoceridae. Mayflies are represented by Ephemerellidae, Heptageniidae and Caenidae.

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River Type: Low altitude (<200m), Small (10 to 100 km^2), siliceous; Northern Ireland type 25.

River Callan County Armagh

Type Overview: In Northern Ireland, this type is found in large areas of South Down and South Armagh with smaller areas in Co Londonderry and Co Tyrone.

Examples of rivers at or near reference conditions falling into this category are parts of the Lagan, Callan and Forkhill rivers.

Morphology: Small, low altitude rivers. This type will have glides and riffles associated with it, the substrate being stable boulder and cobble interspersed with finer gravel and sand material.

Hydrology: Siliceous catchments are more likely to have a lower base flow index. The hydrological regime is therefore more likely to have less connectivity with groundwater and to respond more quickly to rainfall events. Less rainfall is experienced at lower elevations. Catchments at lower elevations can therefore be expected to show smaller discharges per unit catchment area. Smaller catchments show a quick hydrological response to rainfall. The hydrograph time-to-peak and return to base flow will therefore be relatively speedy.

Physico-chemistry: Mixed alkalinity values.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Esox lucius* (pike), *Abramis brama* (bream), *Rutilus rutilus* (roach), *Anguilla anguilla* (eel), *Perca fluviatilis* (perch), *Gobio gobio* (gudgeon), *Phoxinus phoxinus* (minnow), *Pungitius pungitius* (ten spine stickleback) and *Gasterosteus aculeatus* (three spine stickleback).

Macrophytes: Very few bryophytes are found in this type in Northern Ireland with only *Fontinalis antipyretica* occurring regularly. Higher plants are represented by *Oenanthe crocata*, *Potamogeton natans, Sparganium erectum* and *Sparganium emersum.*

Macroinvertebrates: Caddis fly families include Hydropsychidae, Limnephilidae, Rhyacophilidae, Polycentropodidae, Sericostomatidae, Goeridae and Leptoceridae. Mayflies are represented by Heptageniidae, Leptophlebidae, Ephemerellidae and Caenidae, and stoneflies by Nemouridae.

River Type: Low altitude (<200m), Medium (<100 to 1000 km^2), siliceous; Northern Ireland type 26.

River Bann (Upper) County Armagh

Type Overview: In Northern Ireland this type is found in parts of the River Faughan, Co Londonderry, parts of the River Derg, Co Tyrone, and in large areas of Co Down and Co Armagh.

Examples of rivers at or near reference conditions falling into this category are parts of the Derg, Faughan and Upper Bann rivers.

Morphology: Medium size rivers at low altitude. The flow will vary from fast in some places to slow in others, with deposition in the slow flowing areas. This type will have deep riffles associated with it and a well mixed substrate of sand, gravel and boulders.

Hydrology: Siliceous catchments are more likely to have a lower base flow index. The hydrological regime is therefore more likely to have less connectivity with groundwater and to respond more quickly to rainfall events. Less rainfall is experienced at lower elevations. Catchments at lower elevations can therefore be expected to show smaller discharges per unit catchment area. The larger upstream area of medium sized catchments reduces the speed of the hydrological response to rainfall. This extends the hydrograph time-to-peak and slows the return to base flow.

Physico-chemistry: Mixed alkalinity values.

Fish: *Salmo salar* (Atlantic salmon), *Salmo trutta* (brown trout), *Anguilla anguilla* (eel) and *Noemachellus barbatulus* (stone loach).

Macrophytes: The main bryophytes found across this type are *Fontinalis antipyretica* and *Rhynchostegium riparioides* and also *Chiloscyphus polyanthos.* Few higher plants are found with only *Ranunculus penicillatus* var. *penicillatus* being frequent.

Macroinvertebrates: Caddis flies found across this type are Hydropsychidae, Limnephilidae, Polycentropodidae, Rhyacophilidae, Sericostomatidae and Lepidostomatidae. Stoneflies include Nemouridae and Leutridae, and mayflies are represented by Ephemerellidae and Heptageniidae. This type contains one of the few areas, i.e. part of the Derg system, where Aphelocheiridae are found.