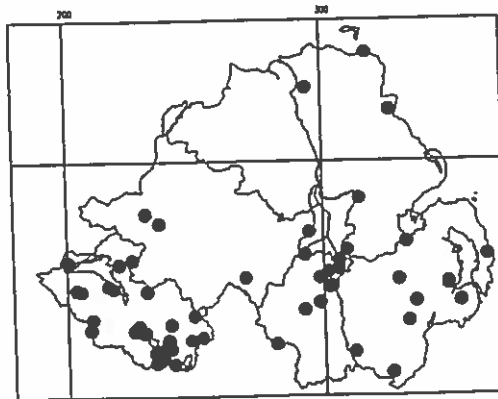




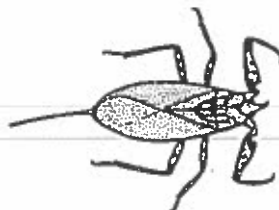
R23848

THE  
DISTRIBUTION OF THE  
AQUATIC HETEROPTERA  
IN NORTHERN IRELAND.

A report to the Environment Service, Department of Environment (NI)



Brian H. Nelson  
December 1993



## CONTENTS

Contents .....	2
Acknowledgements .....	4
Introduction.....	5
Aquatic Heteroptera: Classification and Biology .....	6
Checklist of Irish Species .....	9
Previous records.....	11
Methodology .....	11
Results .....	13
Species accounts .....	14
<i>Hebrus ruficeps</i> .....	16
<i>Hydrometra stagnorum</i> .....	18
<i>Velia caprai</i> .....	20
<i>Microvelia reticulata</i> .....	22
<i>Gerris costai</i> .....	24
<i>Gerris lateralis</i> .....	26
<i>Gerris thoracicus</i> .....	28
<i>Gerris argentatus</i> .....	30
<i>Gerris lacustris</i> .....	32
<i>Gerris odontogaster</i> .....	34
<i>Aquarius najas</i> .....	36
<i>Limnopus rufoscutellatus</i> .....	38
<i>Nepa cinerea</i> .....	40
<i>Notonecta glauca</i> .....	42
<i>Notonecta obliqua</i> .....	44
<i>Micronecta poweri</i> .....	46
<i>Cymatia bonndorffii</i> .....	48
<i>Glaenocoris propinqua</i> .....	50
<i>Callicorixa praeusta</i> .....	52
<i>Callicorixa wollastoni</i> .....	54
<i>Corixa dentipes</i> .....	56
<i>Corixa punctata</i> .....	58
<i>Corixa iberica</i> .....	60
<i>Corixa panzeri</i> .....	62
<i>Hesperocoris linnaei</i> .....	64
<i>Hesperocoris sahlbergi</i> .....	66
<i>Hesperocoris castanea</i> .....	68
<i>Hesperocoris moesta</i> .....	70
<i>Arctocoris germari</i> .....	72

Sigara dorsalis.....	74
Sigara distincta.....	76
Sigara falleni.....	78
Sigara fallenoidea.....	80
Sigara fossarum.....	82
Sigara scotti.....	84
Sigara lateralis.....	86
Sigara nigrolineata.....	88
Sigara concinna.....	90
Sigara semistriata.....	92
Sigara stagnalis.....	94
Habitats.....	96
Small lakes.....	96
Large Lakes.....	99
Ponds.....	100
Other sites.....	102
Additional species.....	104
Conclusions.....	106
Summary.....	107
References.....	108
Appendix 1: Site list.....	110
Appendix 2: Site species lists.....	115
Appendix 3: NILS Water Chemistry categories:.....	120
Appendix 4: Species habitat table.....	121
Appendix 5: Summary of status.....	122

## ACKNOWLEDGEMENTS

I wish to thank the following for their assistance in this survey

Environment Service, Dept of Environment for grant aid.

The Praeger fund of the Royal Irish Academy for grant aid.

Richard Weyl (Environment Service) for information, assistance and many samples.

The Northern Ireland Lake Survey for samples (via Robert Nash in the Ulster Museum).

Dr Garth Foster for introducing me to the aquatic Coleoptera.

Finally my wife Shirley who put up with me on visits to remote bogs and lakes and during the time spent identifying and writing up.

## INTRODUCTION

This report details the findings of a study into the distribution and ecology of the aquatic Heteroptera in lakes and open water habitats in Northern Ireland. Grant-aid was received from the Environment Service of the Department of Environment for Northern Ireland to cover travel and equipment costs. A grant was also received from the Praeger fund of the Royal Irish Academy for the purchase of a microscope.

The study was prompted by the author attending a course in June 1988 at which Dr G. Foster (organiser of the water beetle mapping scheme) introduced him to the collection of aquatic Coleoptera (beetles). Up to that time the water beetle recording scheme had received no recent records of aquatic Coleoptera from N. Ireland and this was seen as one of the major gaps. Similarly the aquatic Heteroptera was a vastly under-recorded group in Northern Ireland. As the collection of both groups involved the same collecting methods, it was proposed to gather records of both.

The initial study proposed collecting solely from lakes. In 1989 the Northern Ireland Lake survey commenced. This was a botanical survey with the aim of describing the range of aquatic plant communities in and around the edges of lakes in N. Ireland. The results of this would be available to test any correlation with invertebrate communities. However this would have restricted the sampling of both groups to only those species found in lakes. Many of the target species do not inhabit lakes, therefore a biased picture would have emerged of the distribution of these species. Other still-water habitats were therefore included. This decision was vindicated by the findings.

This report will summarise the findings of the survey. It will deal exclusively with the aquatic Heteroptera. The aquatic Coleoptera data has already been used in an analysis of the entire Irish water beetle communities (Foster *et al* 1992).

## AQUATIC HETEROPTERA

### CLASSIFICATION AND BIOLOGY

The aquatic Heteroptera is part of the of the order Hemiptera (the true bugs). This order is characterised by the presence of sucking mouthparts and includes such diverse insects as the aphids, cicadas, froghoppers, shieldbugs and bedbugs. Many of the bugs superficially resemble beetles (Coleoptera) but can be readily distinguished by the form of the wings and the mouthparts. The Heteroptera is one of four suborders of the Hemiptera, which contains approximately 80000 described species world-wide. Approximately 530 species of Heteropteran (out of a total of 1700 Hemiptera species) are known to occur in Britain and Ireland.

The aquatic Heteroptera, as defined for this purpose, are those species which exist in or on open water. Other species of bug are closely associated with aquatic and wetland habitats but do not require the presence of open water.

In general the life history of all the aquatic Heteroptera follows a similar pattern. Adults mate in spring and then die off. The young stages mature to adults during early summer. Adults overwinter either in water bodies (Nepomorpha) or in adjacent vegetation (Gerromorpha). The only exception to this is found in the Micronectinae which overwinter in a larval stage.

The adults of many species of aquatic Heteroptera show wing polymorphism. Individuals exist in wingless state (apterous), reduced-winged state (micropterous) or fully-winged (macropterous). In some species the entire population exists in a winged state. In others only a few winged individuals occur, but there is evidence that factors such as population density and weather can affect the relative proportions of the morphs. Whether the normal morph within the population is capable of flight will affect a species ability to colonise new sites and will have a strong bearing on its distribution.

The aquatic Heteroptera are classified into two Infraorders, the Gerromorpha and the Nepomorpha (Savage 1989). The biological characteristics of the families within these are summarised below. The accounts only refer to families and genera with Irish species.

## GERROMORPHA

There are four families in this infraorder with species found in Ireland, the Hebridae, Veliidae, Hydrometridae and Gerridae. These families include species which live on the water surface or amongst aquatic mosses.

### Hebridae

The Hebridae are small, predatory insects less than 2.0 mm in length. They are flightless insects that live amongst *Sphagnum* mosses at the edge of water bodies. The only Irish genus is *Hebrus*.

### Hydrometridae

This family comprises long (9-12 mm in length), thin insects that live on the water surface. They are predatory species, feeding on small aquatic crustaceans taken through the water surface, or on insects trapped on the water surface. *Hydrometra* is the only genus found in Ireland.

### Veliidae

Commonly called water crickets, the Veliidae comprise species that live on the water surface of rivers and ponds. The adults feed on trapped insects or small aquatic crustaceans. The species are often highly gregarious. Two genera are found in Ireland. *Microvelia* are small insects between 1.4 and 2.5 mm when adults, whilst *Velia* are larger insects, up to 8.0 mm when adult.

### Gerridae

These are the most highly specialised of the surface-film dwellers. The pond-skaters, as they are commonly called, are predators which feed on insects trapped on the water surface. Adaptions for this include grasping front legs, long, thin mid and hindlegs for locomotion and large eyes. Gerrids also have highly evolved social mechanisms, exhibiting courtship and territorial behaviour, which both rely on the production of surface vibrations. Three genera are found in Ireland, *Gerris*, *Aquarius* and *Limnopus*. The adults vary in size from 6.5 mm in the smallest *Gerris*, to 18 mm in *Aquarius* and *Limnopus*.

## NEPOMORPHA

The truly aquatic bugs are all contained within this infraorder. Five families are found in Ireland. Though the species are aquatic the adults are all

air-breathers, most relying on a surrounding air bubble which is periodically renewed at the water surface.

### **Nepidae**

Only one genus is found in Ireland, containing just a single species, the water-scorpion, *Nepa cinerea* (length 17.0-23.0 mm). This predatory insect breathes through an elongated breathing tube when adult. It feeds on a wide variety of prey, including items as large as small fish, which are caught by the powerful, grasping front legs.

### **Aphelocheiridae**

This family contains the most aquatic species of the group, as the adults do not need to come to the surface to breathe. Instead the surrounding air bubble is renewed by diffusion. The adults prey on insect larvae which they capture by ambush. Only one species, *Aphelocheirus aestivalis* (length 8.0-10.0 mm) is found in Ireland.

### **Notonectidae**

The Irish species are all in the genus *Notonecta*, which are the familiar backswimmers. The species are active predators catching a wide variety of prey by ambush. These large insects, which can grow up to 16 mm, have well-developed eyes and grasping forelegs.

### **Pleidae**

Only one species is found in Ireland. Pleids are small insects (1.8-2.8 mm) like small versions of *Notonecta*, which are found clinging to aquatic plants where they catch their prey of small crustaceans.

### **Corixidae**

This is the largest family of aquatic bugs, with 8 genera and 28 species. The insects range from the tiny *Micronecta* species at 2.5 mm, to the *Corixa* species which are up to 14 mm in length. The family contains herbivorous and carnivorous species, plus detritivores and generalist omnivores. Most species can fly. The production of sound by stridulation is a feature of this family and is used by the males in courtship.



## CHECKLIST OF IRISH SPECIES

The following is a checklist of the Irish aquatic Heteroptera. The nomenclature follows Savage (1989).

### HEBRIDAE

*Hebrus ruficeps* (Thomson)

### HYDROMETRIDAE

*Hydrometra stagnorum* (Linnaeus)

### VELIIDAE

*Velia caprai* Tamanini

*Velia saulii* Tamanini

*Microvelia reticulata* (Burmeister)

*Microvelia pygmaea* (Dufour)

### GERRIDAE

*Gerris costai* (Herrich-Schaeffer)

*Gerris lateralis* Schummel

*Gerris thoracicus* Schummel

*Gerris argentatus* Schummel

*Gerris lacustris* (Linnaeus)

*Gerris odontogaster* (Zetterstedt)

*Aquarius najas* (DeGeer)

*Linnoporus rufoscutellatus* Latreille

### NEPIDAE

*Nepa cinerea* Linnaeus

### APHELOCHEIRIDAE

*Aphelocheirus aestivalis* (Fabricius)

### NOTONECTIDAE

*Notonecta glauca* Linnaeus

*Notonecta marmorea* Fabricius

*Notonecta obliqua* Gallen

*Notonecta maculata* Fabricius

PLEIDAE

*Plea leachi* McGregor and Kirkaldy

CORIXIDAE

- Micronecta poweri* (Douglas & Scott)  
*Cymatia bondsdorffii* (Sahlberg)  
*Glaenocorisa propinqua* (Fieber)  
*Callicorixa praeusta* (Fieber)  
*Callicorixa wollastoni* (Douglas & Scott)  
*Corixa dentipes* (Thomson)  
*Corixa punctata* (Illinger)  
*Corixa iberica* Jansson  
*Corixa affinis* Leach  
*Corixa panzeri* (Fieber)  
*Hesperocorixa linnaei* (Fieber)  
*Hesperocorixa sahlbergi* (Fieber)  
*Hesperocorixa castanea* (Thomson)  
*Hesperocorixa moesta* (Fieber)  
*Arctocorisa germari* (Fieber)  
*Sigara dorsalis* (Leach)  
*Sigara distincta* (Fieber)  
*Sigara falleni* (Fieber)  
*Sigara fallenoidea* (Hungerford)  
*Sigara fossarum* (Leach)  
*Sigara scotti* (Fieber)  
*Sigara lateralis* (Leach)  
*Sigara nigrolineata* (Fieber)  
*Sigara concinna* (Fieber)  
*Sigara semistriata* (Fieber)  
*Sigara venusta* (Douglas and Scott)  
*Sigara selecta* (Fieber)  
*Sigara stagnalis* (Leach)

Total number of species in Ireland 49

Total number of species in Great Britain 61

## PREVIOUS RECORDS

The lack of records from Northern Ireland of this group is striking. The only checklist of the Irish Hemiptera was written by Halbert in 1935. Records from the north were included but most dated from the turn of the century and came from two sources. The first was the Reverend Johnston who was a prominent entomologist noted principally for his work on Coleoptera. He collected in Co. Armagh and also the Portnoo/Ardara area of Donegal. The second was the work of C. C. Buckle who contributed records from the Foyle area of Donegal and Londonderry. Most of his records came from Culkeeragh and Culmore Moss. From these two localities Buckle recorded a considerable proportion of the Irish fauna. This includes several species not recorded in N. Ireland in this survey.

The next significant publication was that of Macan in 1954. This included data on the distribution of corixids in some northern lakes and included records of *Sigara fallenoidea* (*S. pearcei* in this paper). In 1958 Leston produced a summary paper giving vice-county lists for the Nepomorpha in Ireland. Few northern records had been added to those published by Halbert and the influence of the Buckle records can still be seen. The list of recorded species for East Donegal was 26 species out of 34, which was second highest total for any vice-county.

The only other recent publications with N. Irish records of this group are Flower (1982), who gives records from some of the Rathlin ponds and lakes, and Wood and Smith (1993), which includes records and ecological notes on the corixids of Lough Neagh by MacFadyen

## METHODOLOGY

Field work for the project started in 1989 and covered the next three years. Sites were visited from early spring to late autumn each year. Compared to many other insects the aquatic Heteroptera exhibit relatively little seasonality. Most species are adult for nine months, though they are generally inactive in winter. In addition as the adults of the Heteroptera all die off in early summer, there is a period in June or July when the adults are very hard or impossible to find. Less recording was therefore done in this mid-summer period.

Sites were sampled using a robust pond net from accessible margins of the open water, in shallow water and from beds of macrophytes and emergent vegetation whenever these were present. Sampling continued until it was considered that no additional species were being collected. Whilst this was not a rigidly defined method, it was considered that the sampling was generally thorough as species are hard or impossible to identify in the field and the tendency was always to take specimens for later identification.

Specimens were also obtained from other sources. The Northern Ireland Lake Survey (hereafter referred to as NILS) collected in the course of the sampling of aquatic macrophytes, some invertebrates including specimens of both groups. These have all been checked and identified by the author. Many of the NILS samples came from reservoirs, a habitat otherwise largely ignored. The second source was the collections made by Richard Weyl of the Environment Service, who provided specimens of aquatic Heteroptera collected whilst sampling for Coleoptera. Both these sources produced valuable additional records.

A note of caution however has to be added to the NILS samples regarding the date the botanical fieldwork was undertaken and the sampling technique. The former was concentrated in the summer months so would have coincided with the worst time to collect corixids. At many sites adults would not have been present. Also the sampling of the aquatic vegetation means that the surface-dwellers would not have been collected and it is considered they are under-represented in the NILS samples.

A literature search was conducted and a few additional historical records have also been obtained and some of these have been included in the maps.

The specimens were identified using available literature. For the aquatic Heteroptera, Savage (1989) is the standard, most recent treatment of the British and Irish fauna. Reference was also made to Macan (1965), Southwood and Leston (1959) and Jansson (1986).

The specimens have all been kept and have been stored in 70% ethanol. Apart from a small reference collection the remainder will be offered to the Ulster Museum. All records have been sent to the appropriate national recording scheme organiser. The author has entered all the records on to a computer database using the Recorder package, and they will be incorporated into the N. Ireland Biological Records database in the Ulster Museum.

## RESULTS

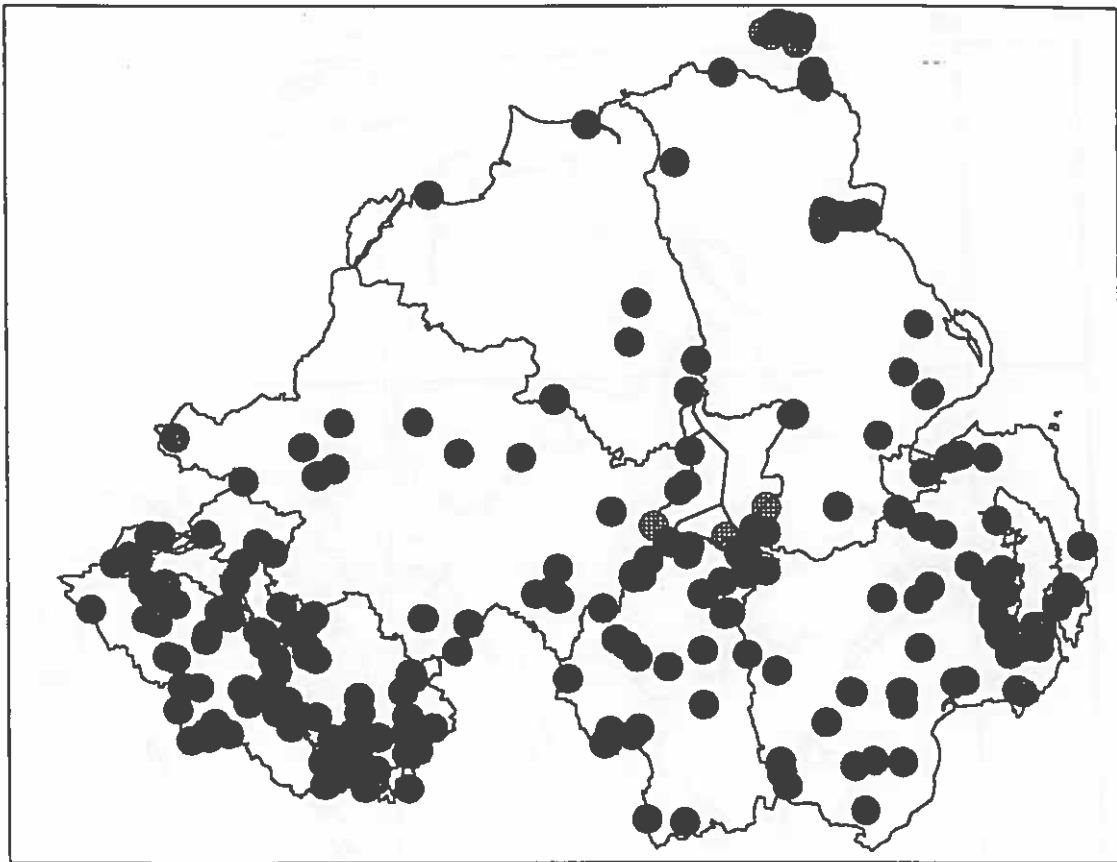
Records of aquatic Heteroptera were obtained from 237 sites throughout N. Ireland. Each site is defined as a separate water body or habitat type within a water body. Appendix 1 lists these sites by site number used in this survey. It also gives the grid reference, altitude of the site, and NILS category. Appendix 2 lists the species recorded at each site. It also gives the Recorder site number that the records have been input on.

Map 1 shows the distribution of these sites throughout N. Ireland. Coverage has clearly not been even, though this is partially due to the distribution of lakes, which were the main habitat that was sampled (see NILS volume 1).

The species accounts are laid out in a standard format and are in systematic order. For each species recorded in N. Ireland there is a distribution map which shows all the site records as dots. Solid dots are records obtained in this survey. A few maps have additional records derived from either Macan (1954) or Flower (1982). These have hatched shading. Below the map are tables which summarise the distribution of species by habitat type, area of water body, altitude and the category of lake type defined by the chemical status of the water (for a brief explanation of these see Appendix 3). The text on the facing page than describes the main features of the species distribution and reviews its status elsewhere. Where sites are mentioned in the text these are referred to by the site number which is listed in Appendix 1. For abbreviations used throughout the text see page 111.

Following the species accounts there is a discussion of the main habitats surveyed and the species communities found. This highlights the main features of importance of the habitat.

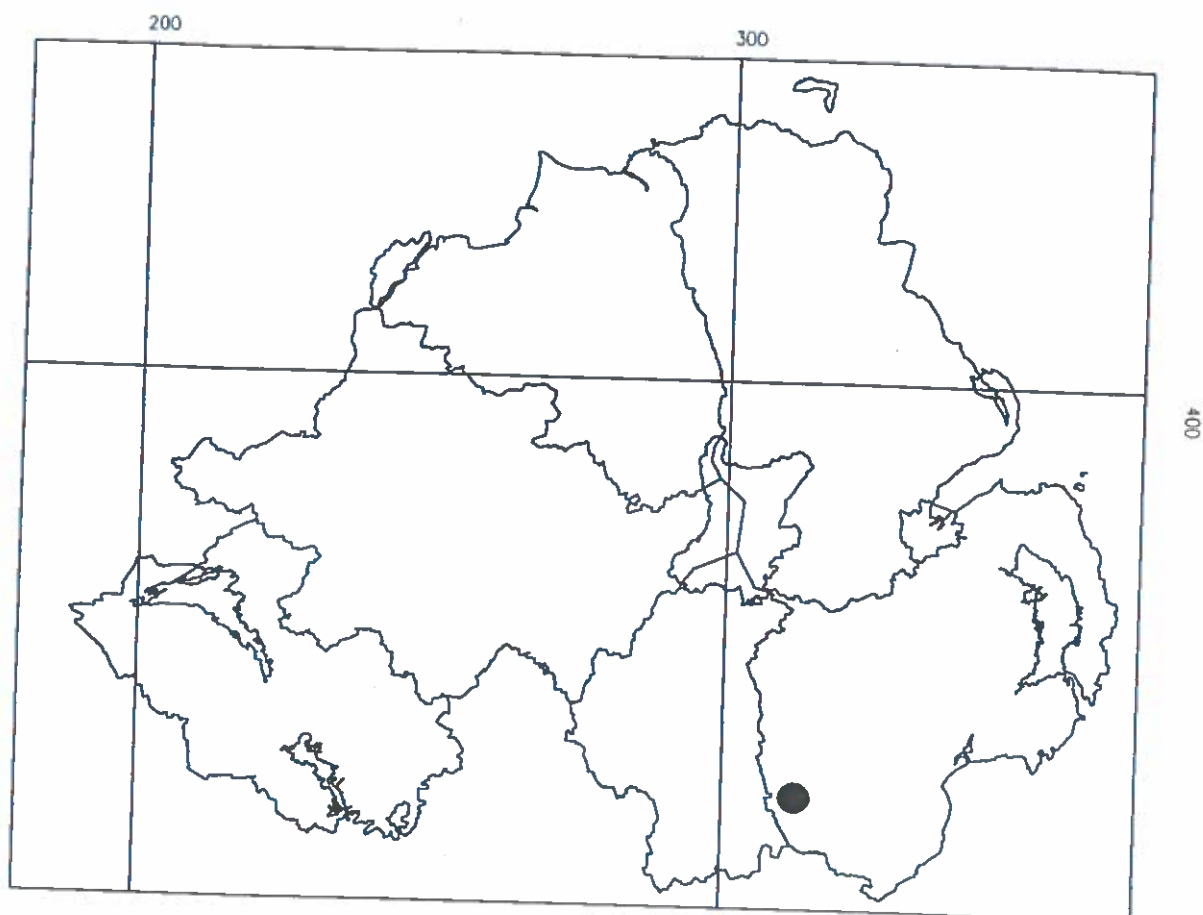
**DISTRIBUTION OF SPECIES  
IN N. IRELAND**



Map 1 Distribution of sites covered

The solid dots are sites with records gathered for this study. The hatched dots refer to literature records. The distribution of sites is not even throughout the Province. However this should be compared to the distribution of lakes in N. Ireland as shown in the NILS report (see Volume 5). This shows similar concentrations of lakes in central and eastern Down, along the Armagh/Tyrone and Armagh/Monaghan borders and in Fermanagh. There are few lakes in north Tyrone, Londonderry and north and central Antrim. The sites covered in this survey do reflect this broad distribution. However some notable areas did receive poor coverage and in particular the central area of Tyrone.

## *Hebrus ruficeps*



Total number of records 1 (0.5%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	-	0-99	1	Large lakes	0
0.25-0.99	-	100-199	0	Lakes	0
1-4.99	-	200-299	0	Reservoirs	0
5.0-9.99	-	300-399	0	Pools	1
10-249.99	-	400+	0	Rivers	0
250+	-	Max	35	Other	0

No information from NLS sites



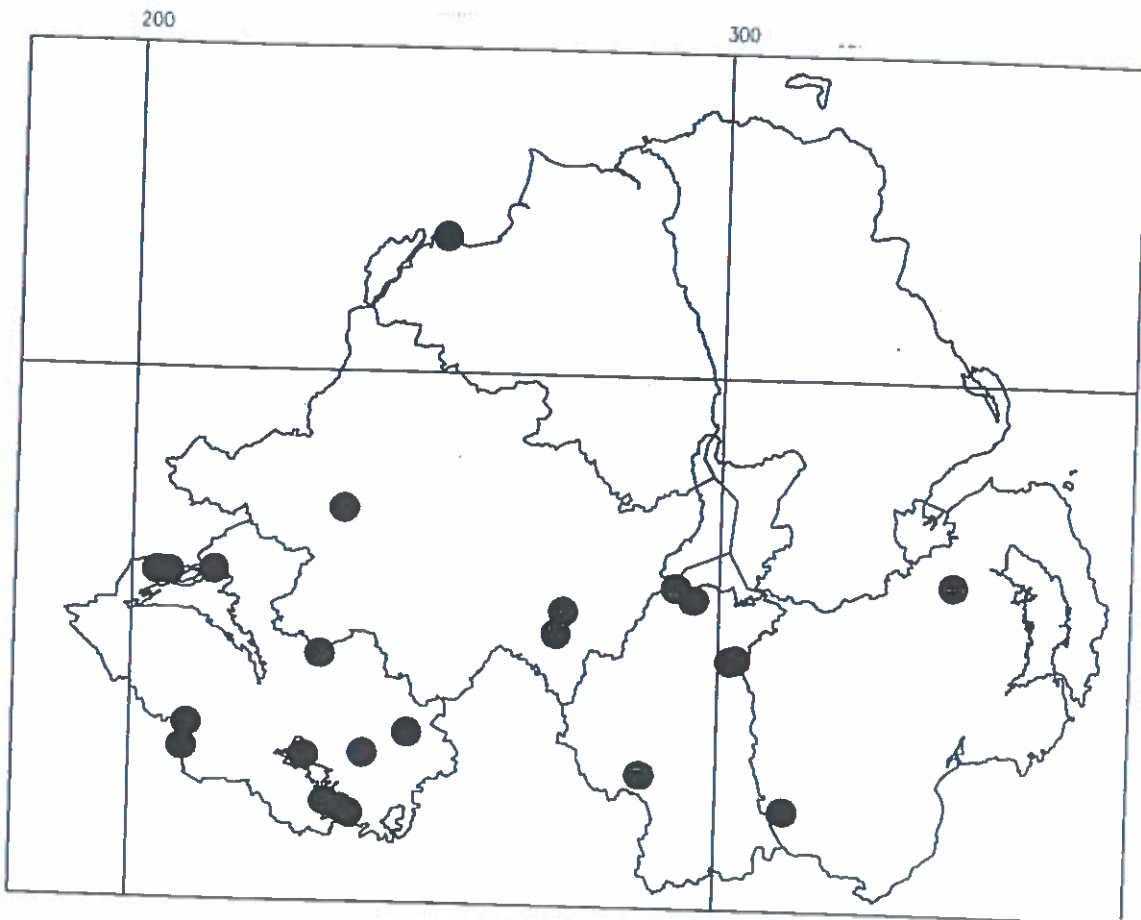
### *Hebrus ruficeps*

This tiny bug lives amongst moss at the edge of ponds, rivers and lakes. To find it usually involves specific searching. This was rarely carried out on the sites, so it is not surprising that there was only one record of *Hebrus ruficeps*. This was from the fen at Derryleckagh, Down (173) where it was found in moss carpets in an area of fen and pools.

Previous records however do not suggest the species is particularly common, though the habitat it occupies is relatively common. Kirby (1983), for example, expressed surprise at only finding it at one site in Kerry. Halbert (1935) however considered it to be abundant and probably widespread. Whilst the first Irish record of *H. ruficeps* was from the Ulster Canal at Monaghan, no other records from Ulster were listed in Halbert (1935).

In Britain *H. ruficeps* is mainly a southern species and has not been recorded from Scotland (Savage 1989). A second species, *H. pusillus*, is also present in Britain and has a similar, southern distribution. It has not been recorded from Ireland.

## *Hydrometra stagnorum*



Total number of records 22 (9%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	2	0-99	15	Large lakes	4 (6sites)
0.25-0.99	2	100-199	6	Lakes	12
1-4.99	7	200-299	1	Reservoirs	0
5.0-9.99	3	300-399	0	Pools	2
10-249.99	0	400+	0	Rivers	0
250+	6	Max	205	Other	2 (C, CL)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	1	3	1	0	0	0	1	2	2

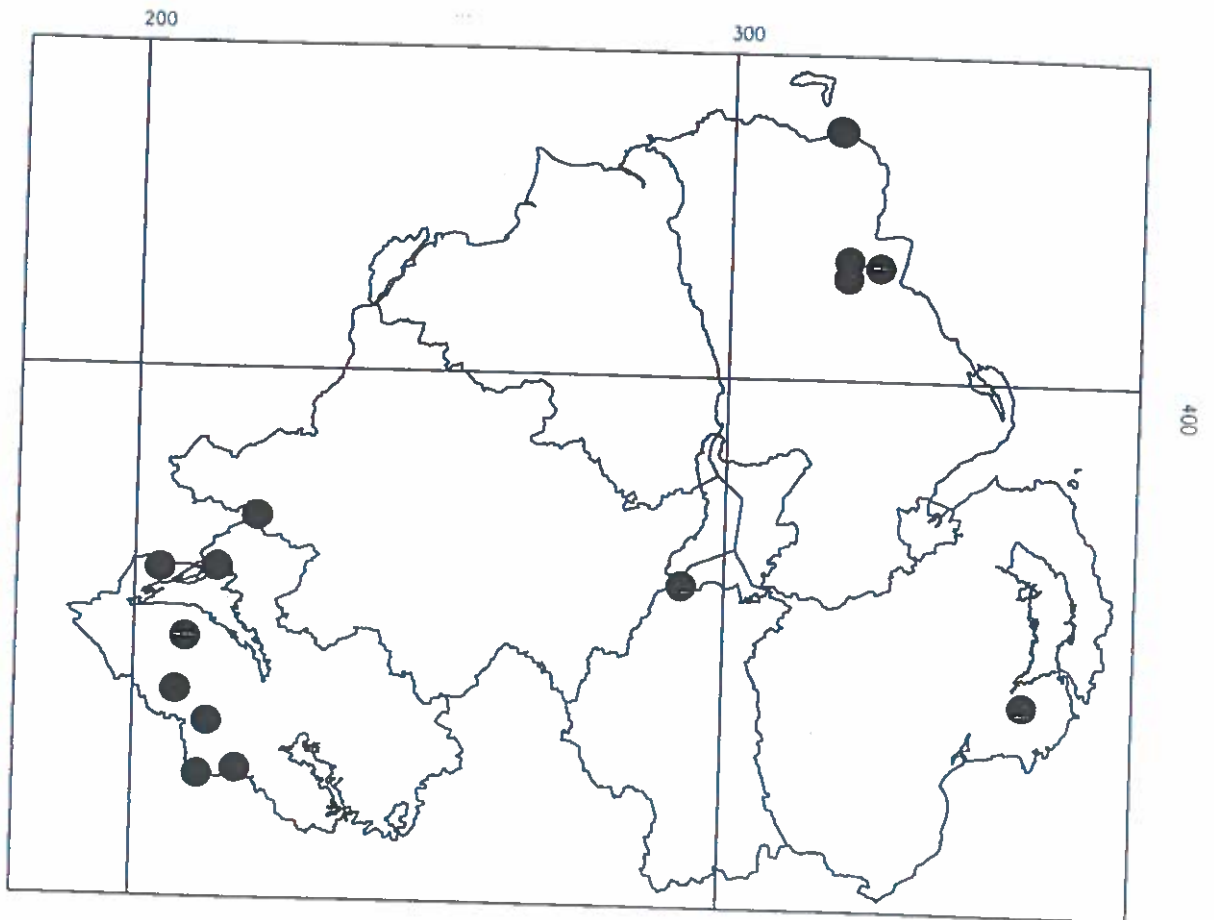
### *Hydrometra stagnorum*

This insect, commonly called the water-measurer, is found throughout Britain and Ireland. A second, much rarer species, *Hydrometra gracilentata*, is restricted to a few sites in southern England (Kirby 1992).

Most of the records of *Hydrometra stagnorum* were from lakes, including several of the large lakes (024, 025, 030, 113). It was recorded also from two lowland fens (056, 173), a section of disused canal (067) and a coastal ditch (215). Most of the sites were lowland sites, though still with a significant proportion (33%) over 100m. The maximum altitude it was found at was 205m in Armagh (178). The lakes covered the entire range from shallow peaty lakes with little emergent vegetation, to eutrophic reed-fringed sites. No association was detected from NLS data. As *H. stagnorum* is a surface dweller, the chemical composition of the water and the macrophyte communities are unlikely to affect its distribution.

Kirby (1983) recorded the species commonly in Kerry at low altitudes, and also in Cork (Kirby 1991). It is found in Kerry at the edges of oligotrophic lakes and in Connemara in wet areas adjacent to fast-flowing rivers (pers. obs).

## *Velia caprai*



Total number of records 14 (6%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	1	0-99	4	Large lakes	3 (3 sites)
0.25-0.99	1	100-199	6	Lakes	6
1-4.99	2	200-299	2	Reservoirs	1
5.0-9.99	3	300-399	1	Pools	1
10-249.99	0	400+	1	Rivers	3
250+	3	Max	475	Other	0

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	1	1	0	0	0	0	0	0	1

## *Velia caprai*

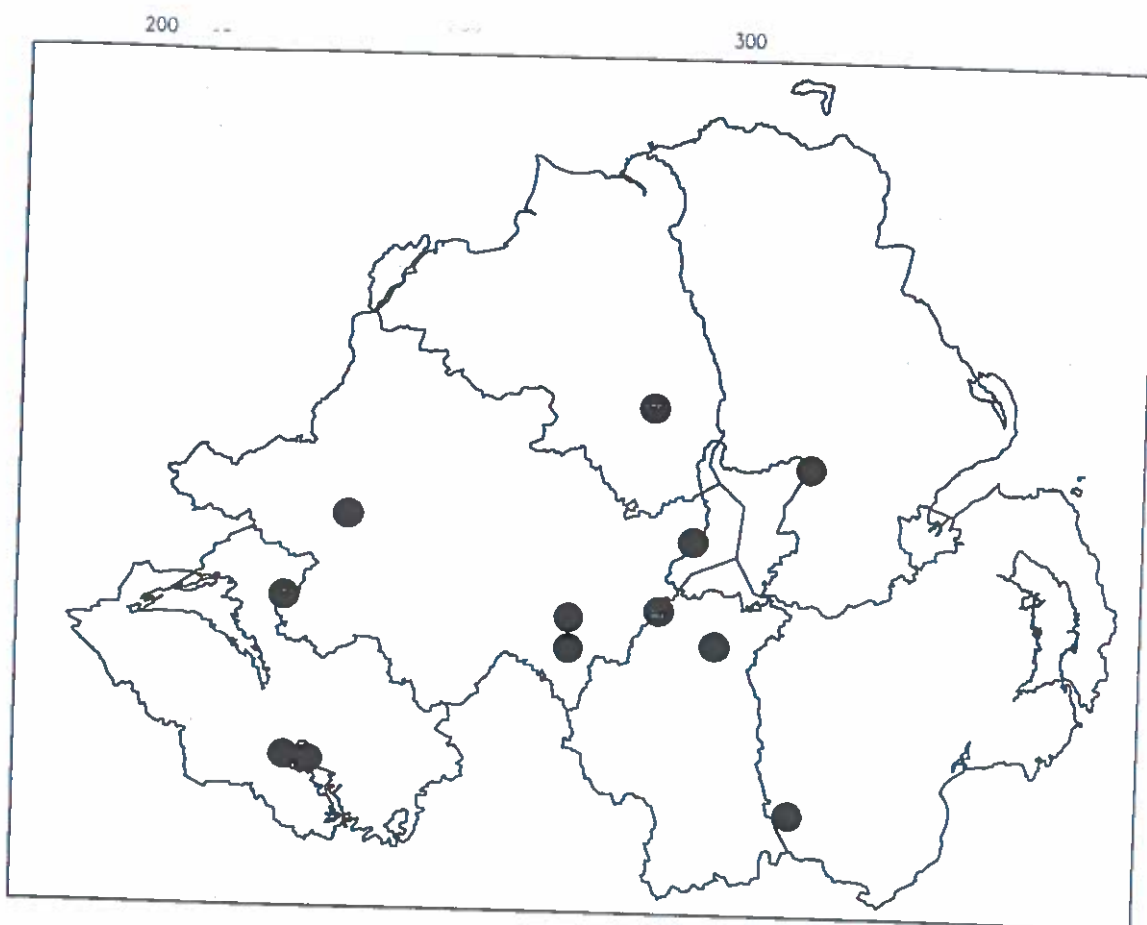
The water cricket, as *Velia caprai* is commonly known, is an easily recognised species. Where it is found it characteristically forms large aggregations on the water surface. In Britain it typically is found on streams, slow-flowing rivers and upland lakes. (Southwood and Leston 1959). Previous records from Ireland indicate a similar pattern (Halbert 1935; Kirby 1983). The species has undoubtedly been under-recorded because of this.

The map shows that *V. caprai* was apparently locally distributed and only recorded commonly in west Fermanagh and north Antrim. There were virtually no records from the other counties. However, the National Trust Biological survey team recorded *V. caprai* from 6 localities in north-east Antrim, and a further 2 in eastern Down. (Andrew Foster pers. comm.). It has also been seen at a large number of sites in Down and Antrim by Richard Weyl (pers. comm.) but details all these records were received too late to include in the maps.

The habitats *V. caprai* was recorded from included small upland streams, a wooded lowland stream, several small lakes and the shores of three of the large lakes (Lower Lough Macnean, Lower Lough Erne and Lough Neagh). Typical upland sites include the streams flowing into the Dungannon Reservoir (181) and the Pollan Burn (205) on the Garron plateau. At some of the small stream sites the species was the only aquatic heteropteran present. At the lakes it was often found with species of *Gerris*. However it is clear that lakes are not the main habitat for this species.

*V. caprai* is distributed throughout Britain and Ireland, including some of the remoter Scottish Islands and up to at least 2500 ft (Southwood and Leston 1959). A related species, *V. saulii*, is found in northern Britain. It has been recorded at several localities in Kerry (Kirby 1983 and 1991). *V. saulii* was not recognised as a distinct species until 1951, so it does not figure in Halbert's account. Records for *Velia* however indicate a wide Irish distribution including such remote localities as Tory Island. Kirby (1983) found *V. caprai* widely and often abundantly on streams, bog pools and lake margins up to 2000'.

## *Microvelia reticulata*



Total number of records 12 (5%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	5	0-99	10	Large lakes	2 (2sites)
0.25-0.99	1	100-199	2	Lakes	5
1-4.99	2	200-299	0	Reservoirs	0
5.0-9.99	2	300-399	0	Pools	5
10-249.99	0	400+	0	Rivers	0
250+	2	Max	150	Other	0

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	1	1	0	0	0	1	0	1	0

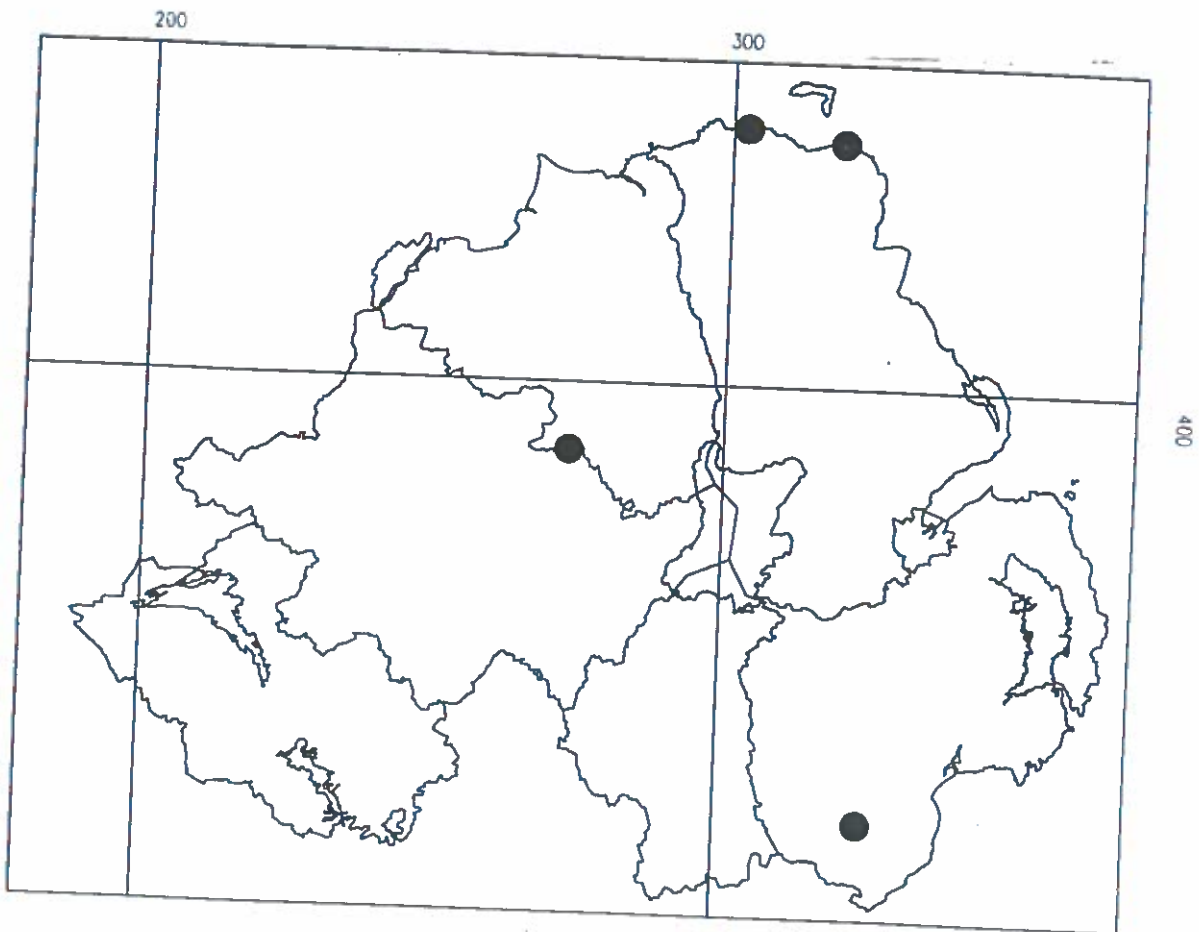
### *Microvelia reticulata*

This tiny predacious bug lives typically in large groups on the water surface, especially in areas of open water amongst stands of emergent vegetation (Southwood and Leston 1959). It is a common species throughout Britain. Two other species *M. buenoi* and *M. pygmaea* also occur in southern England, and the latter has also been found at three sites in Co. Cork (Walton 1981).

Most of the records of *M. reticulata* were from the west of the province where it was found principally at small mesotrophic lakes. It was also recorded at one site on Upper Lough Erne (140) and one site on Lough Neagh (116). It was also found on an overgrown pond close to the N.E. shore of L. Neagh (139). Other records came from ponds on fens and cutover bogs. The records were all at low altitude. The species shows some association with *Hydrometra stagnorum* and *Gerris odontogaster* which were frequently recorded at the same sites.

This species has probably been under-recorded, as its habitat preferences and small size, would mean it was not detected from NILS sampling.

## *Gerris costai*



Total number of records 4 (2%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	4	0-99	1	Large lakes	0
0.25-0.99	0	100-199	1	Lakes	0
1-4.99	0	200-299	1	Reservoirs	0
5.0-10.99	0	300-399	1	Pools	4
10-249.99	0	400+	0	Rivers	0
250+	0	Max	310	Other	0

No information from NILS sites.



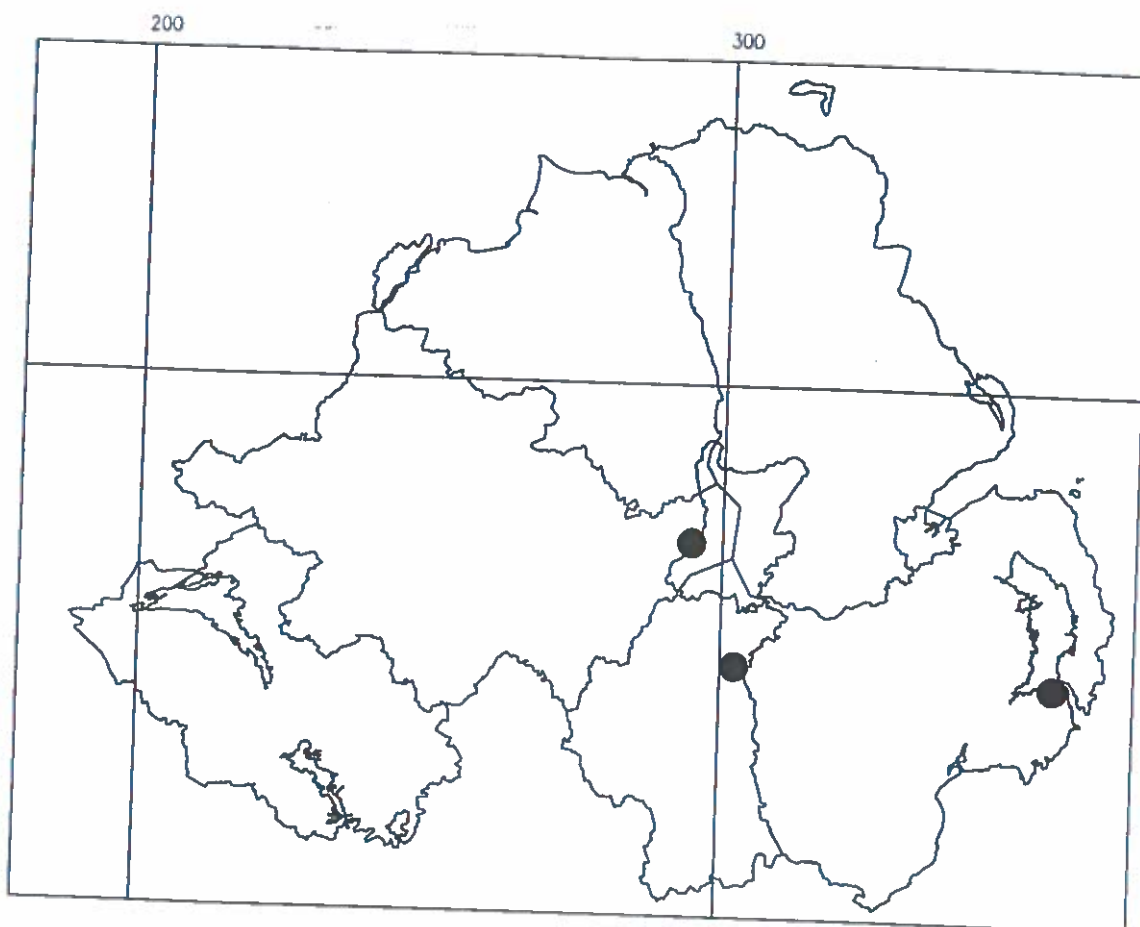
### *Gerris costai*

Three out of the four records for *Gerris costai* were from pools in upland areas. The exception was the record from a temporary pool in the dunes at White Park Bay (106). The upland records came from Teal Lough in the Sperrins (053), a small pool near Lough Fadden on Fair Head (090), and a shallow peaty pool on the summit of Hen Mountain in the Mourne (280).

Most of the previous published Irish records for this large gerrid are from upland and northern areas; there were no records south of a line from Galway to Dublin. It was also recorded at coastal localities in the west of Ireland (Halbert 1935). The only N. Irish record given in Halbert (1935) was from a small pool on the summit of Slieve Gullion in Armagh. There appear to be no other recent published Irish records. Its British distribution is upland and northern and encompasses sea-level pools in the Hebrides (Southwood & Leston 1959). *G. costai* is absent from most of central and southern England (Savage 1989).

In Northern Ireland apparently suitable habitat exists for *G. costai* throughout the upland areas. To date there are no records from the Antrim uplands, notably the Garron Plateau, nor the Cuilcagh area in Fermanagh, areas which both support the upland corixids. The reason for the species absence from these areas, if real, is not immediately discernible. The overall distribution of the species however suggests that it has as much a northern distribution as an upland one.

## *Gerris lateralis*



Total number of records 3 (1%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	2	0-99	3	Large lakes	0
0.25-0.99	0	100-199	0	Lakes	0
1-4.99	1	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	3
10-249.99	0	400+	0	Rivers	0
250+	0	Max	175	Other	0

NILS sites Chemical  
 - 1 site type H

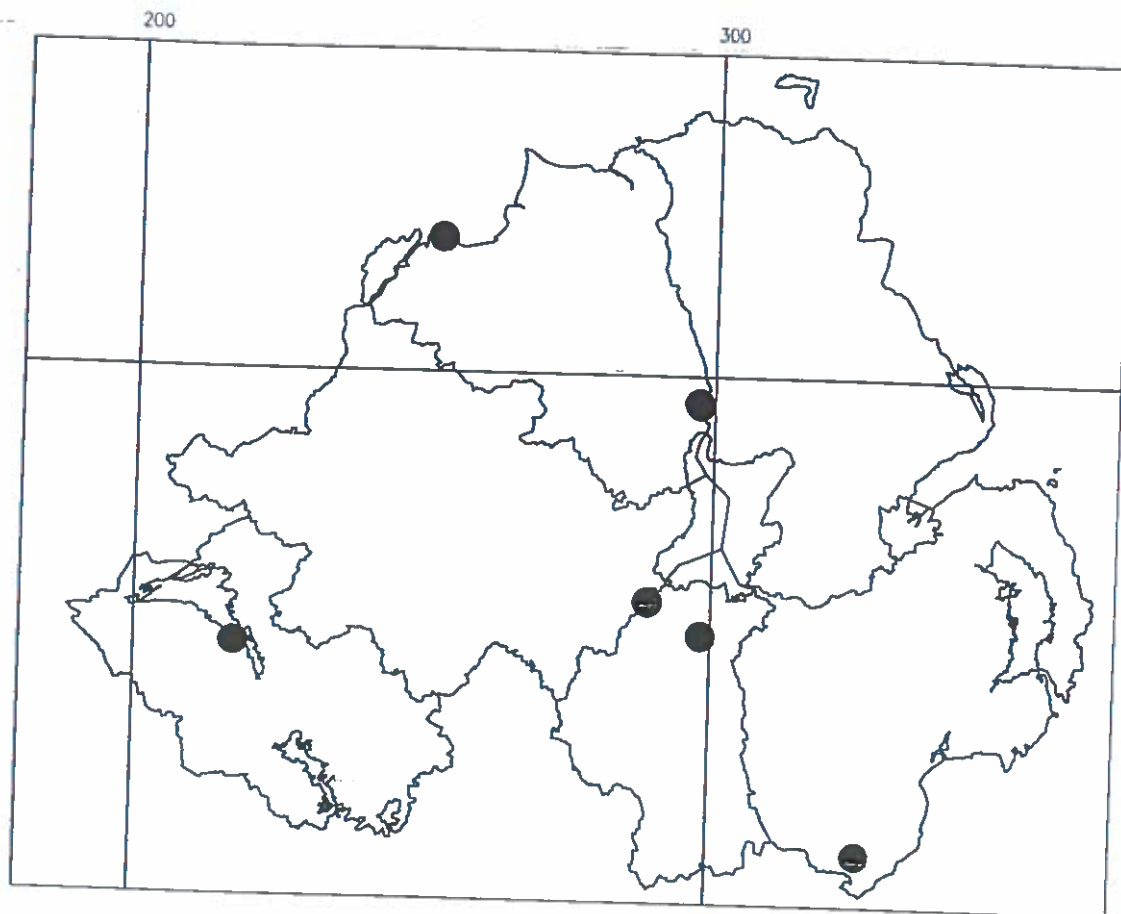
### *Gerris lateralis*

Southwood and Leston (1959) mention that there are only two Irish records of *Gerris lateralis*. It was not mentioned as occurring in Ireland by Halbert (1935), and is not listed in other recent papers on Irish aquatic Heteroptera. In addition, Savage (1989) indicates the species to be uncommon throughout Britain and Ireland. In Great Britain *G. lateralis* has a predominately northern distribution with records from East Anglia northwards. Its habitat is stated to be bog pools and ditches (Southwood and Leston 1959).

This was found to be one of the rarest of the gerrids in N. Ireland. It was recorded from just three sites. Two of these are cutover bogs with flooded peat cuttings and fen pools. One of these sites, at Blacker's Rock (263), was a very shaded, acid pool in a birch-dominated cutover bog; a male and female were taken here and other individuals seen. The second site was at Brackagh Bog (056), which is an area of base-enriched fen with some acid pools. The third locality was a shallow pool at the edge of a eutrophic lake in Co. Down (251). Specimens from the last two sites were collected by Richard Weyl. It is not possible to state whether this species is genuinely rare or whether it is still being overlooked. If bogs are its preferred habitat it may well be a declining species and one worthy of further survey.

*Gerris lateralis* exists in one of three forms, apters, micropters and macropters. The four specimens collected from the sites were all micropters.

## *Gerris thoracicus*



Total number of records 6 (2.5%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	2	0-99	6	Large lakes	1 (1 sites)
0.25-0.99	0	100-199	0	Lakes	0
1-4.99	0	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	2
10-249.99	0	400+	0	Rivers	0
250+	1	Max	45	Other	3 (QP, CL)

No information from NLS sites

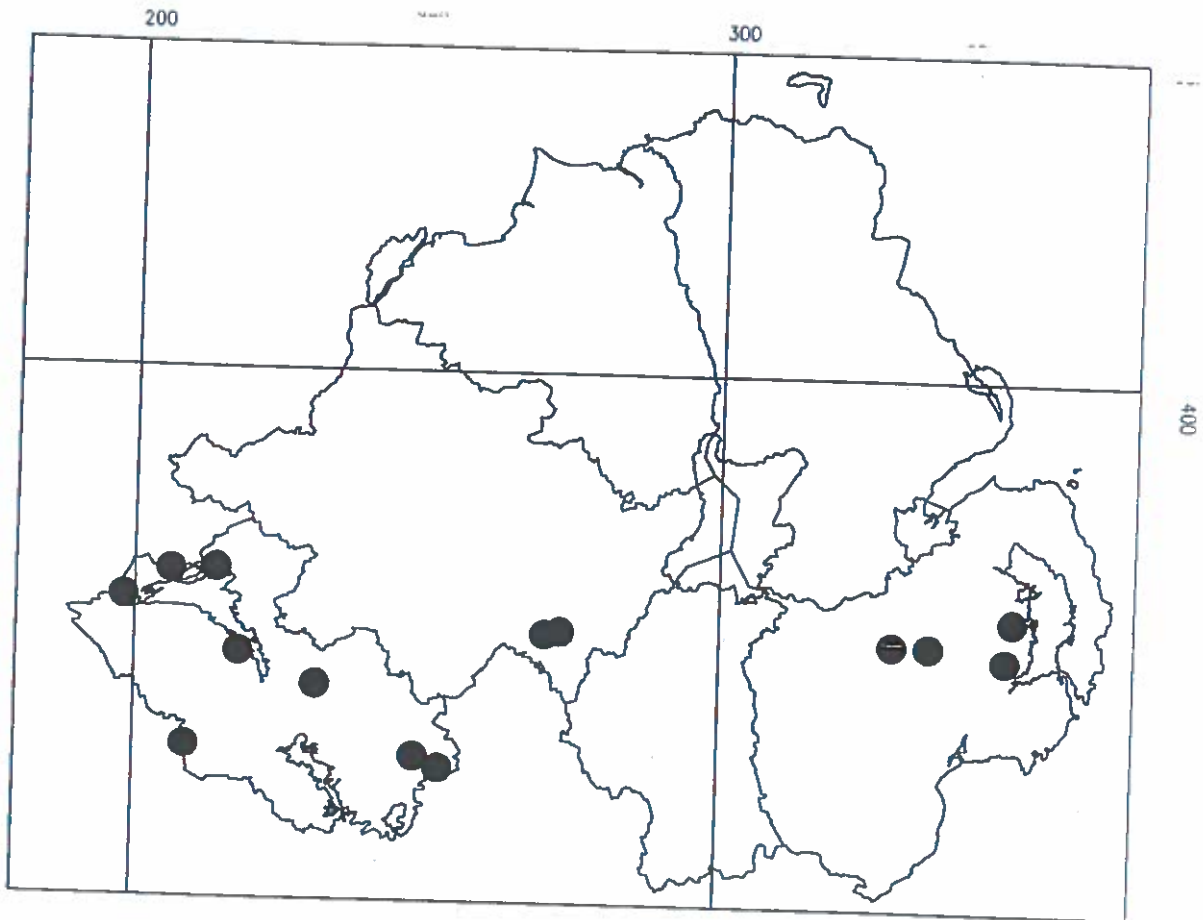
### *Gerris thoracicus*

*Gerris thoracicus* is a medium-sized pond-skater, very similar in appearance to *G. costai*, but smaller. Both species are found on pond sites, but differ in altitudinal distribution. *G. thoracicus* appears on the basis of the survey results to be strictly a lowland species; none of the sites at which it was recorded was above 50 m. In contrast *G. costai* was mostly confined to upland localities.

This species was found most frequently in shallow often very small pools. It was also common at the edge of Lough Beg where the shore is lightly grazed and the water shallow. Other sites include shallow pools in quarries (236, 220) and a sandpit (136), a coastal ditch (215) and a shallow peaty pool in a cutover raised bog (171). In other parts of Ireland *G. thoracicus* is a common inhabitant of pools in saltmarshes (pers. obs). This habitat was outside the scope of this survey, so the importance of coastal sites for *G. thoracicus* in N. Ireland is not known.

Previous Irish records of *G. thoracicus* are published in Kirby (1983 and 1991) and Halbert (1935). Halbert described the species as "a common species, especially in brackish ponds and ditches on the coast". N. Irish records included in his list were from Cave Hill, Antrim and Culmore Moss, Londonderry. It was recorded at Rowallane, Down by the National Trust Biological Survey team in 1992 (A. Foster pers comm.). In Great Britain it is widespread but locally distributed (Southwood and Leston 1959).

## *Gerris argentatus*



Total number of records. 14 (5%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	1	0-99	9	Large lakes	1 (1 sites)
0.25-0.99	1	100-199	4	Lakes	12
1-4.99	8	200-299	1	Reservoirs	0
5.0-9.99	1	300-399	0	Pools	1
10-249.99	2	400+	0	Rivers	0
250+	1	Max	200	Other	0

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	0	2	0	0	0	3	0	4	1

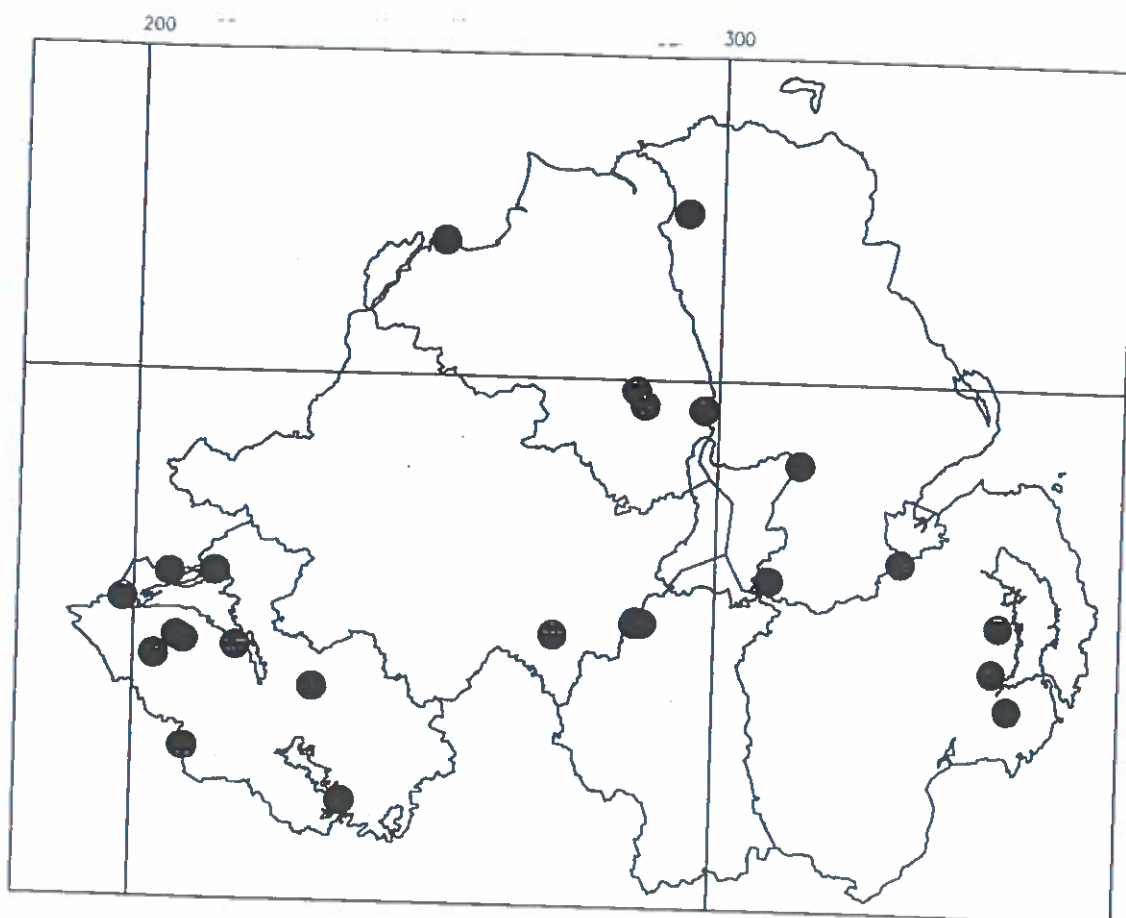
### *Gerris argentatus*

This is the smallest of the Irish gerrids at only 6.5 - 8.0 mm in length. Adults can be identified by the silvery patches of hairs at the rear of the pronotum, which are relatively easy to see in the hand.

*Gerris argentatus* was recorded from 14 sites, all but one a lake. The only pond record was from Clunthagh (072) which is a shallow pond in a tiny area of birch-covered cutover bog. There was one record from Lower Lough Erne, Fermanagh (113). The other lakes had little else obvious in common. They tended to be mesotrophic to highly eutrophic sites, of small to medium size, and at low to mid-altitudes. *Gerris argentatus* was only recorded from three counties, Fermanagh, Tyrone and Down. Most of the records were in the west of the province, though this distribution may have been distorted as a result of the sampling effort as detailed in the introduction.

Only eight records were listed in Halbert (1935), who considered that it was less common than *G. odontogaster*. Half of the listed records of *G. argentatus* were from Armagh and Down. The literature search produced no other published records. In Britain *G. argentatus* is locally distributed throughout England and lowland Wales, but absent from Scotland (Southwood and Leston 1959; Savage 1989).

## *Gerris lacustris*



Total number of records 24 (10%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	7	0-99	20	Large lakes	3 (3 sites)
0.25-0.99	1	100-199	2	Lakes	9
1-4.99	5	200-299	2	Reservoirs	0
5.0-9.99	2	300-399	0	Pools	7
10-249.99	1	400+	0	Rivers	1
250+	3	Max	205	Other	4 (CL, D, QP)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	0	2	1	0	0	1	0	2	2



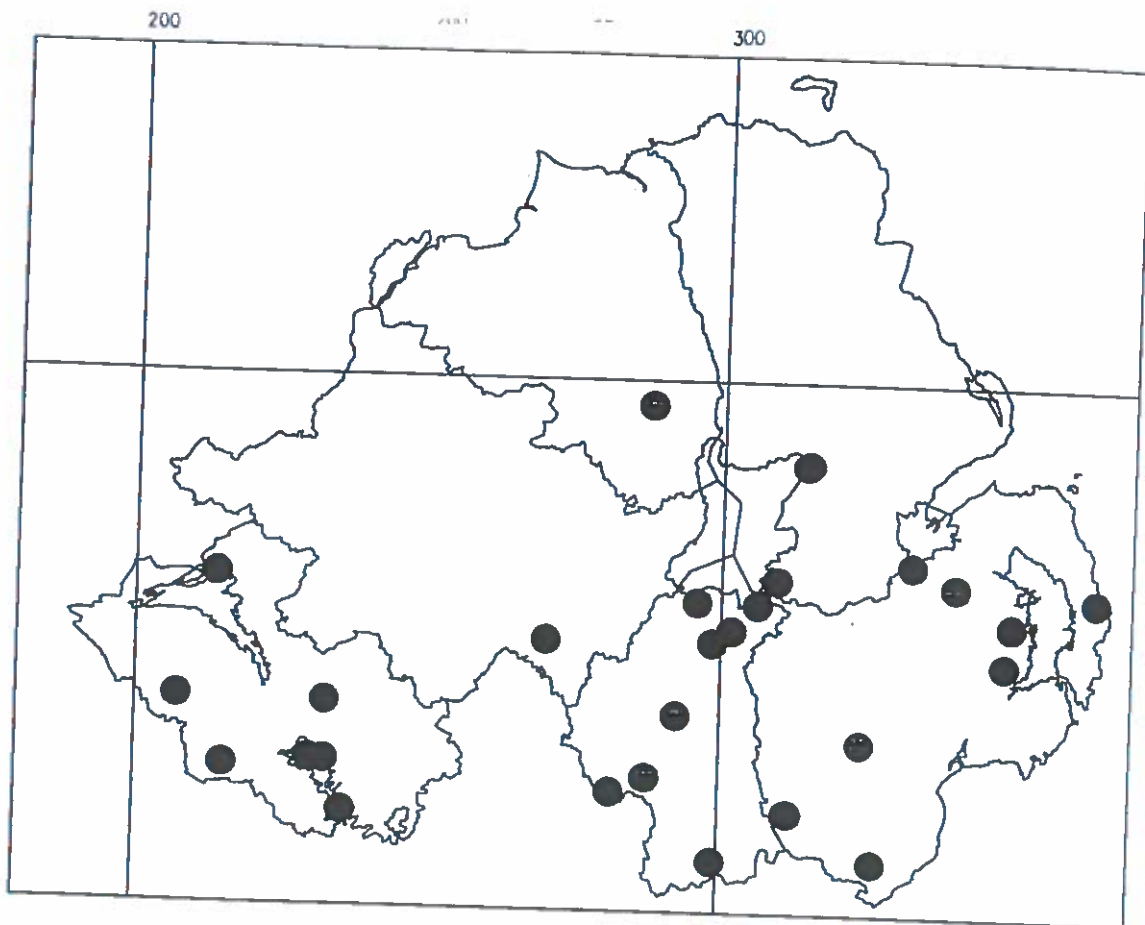
### *Gerris lacustris*

*G. lacustris* is often considered to be the commonest species of pondskater. In this survey it was recorded from 24 sites, three fewer than the most frequent species, *G. odontogaster*. *G. lacustris* had a strongly north-western distribution pattern, in contrast to that shown by *G. odontogaster*. The reasons for this if it is not an artefact are unclear.

The records were evenly split between lake and other sites. It was recorded from Lough Beg (108) and on single sites on Lough Neagh (138) and Lower Lough Erne (113). There were records from small lakes throughout its mapped range. When the distribution is compared to NILS categories no obvious pattern is discernible, though there were no records from very enriched sites or very base-poor sites. The species was also present on flooded peat cuttings often in abundance. At lakes it is found with *G. argentatus* and at pool sites it is frequently found with *Gerris odontogaster*.

The records were predominately from lowland sites, with just two above 200 m. The highest record was at a mesotrophic lake in Fermanagh (037). Kirby (1983) recorded it as common below 100 ft (30m) in the Killarney area. However a record of *G. lacustris* from a peaty pool at 2000 ft (600m) is mentioned in Southwood & Leston (1959). Halbert (1935) considered the species to be common and widely distributed. The records are mostly from unspecified habitats and he lists just three records from N. Ireland.

## *Gerris odontogaster*



Total number of records 27 (10%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	12	0-99	19	Large lakes	2 (3 sites)
0.25-0.99	2	100-199	5	Lakes	11
1-4.99	6	200-299	2	Reservoirs	0
5.0-9.99	2	300-399	0	Pools	12
10-249.99	1	400+	1	Rivers	0
250+	3	Max	410	Other	1 (QP)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	1	2	0	0	0	1	1	1	1

### *Gerris odontogaster*

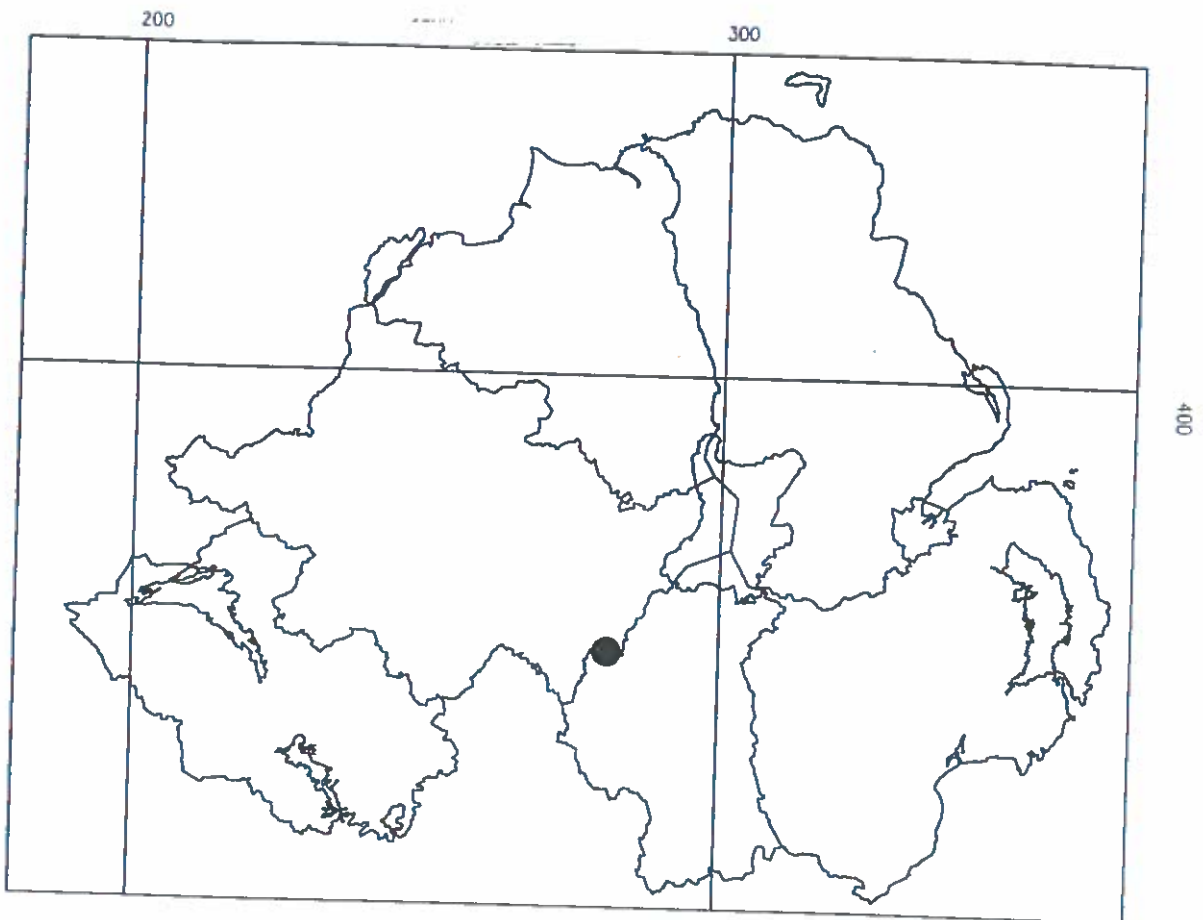
*Gerris odontogaster* is an easy species to identify in the field. Males have two prominent toothed projections on the ventral surface of the abdomen which can easily be seen.

The species was recorded widely across the south of N. Ireland. There was also an eastern bias to the records with most coming from Armagh and Down. Whilst it was most frequently recorded on small lakes, a high proportion of records were from pools. These included most of the major cutover bogs and fens in the east of N. Ireland. The records from Fermanagh and Tyrone were predominately from lakes, including sites on both Lower and Upper Lough Erne (113, 140, 287). On these large lakes it was found on sections of shoreline with sparse fringing swamps and *Carex* fen. The only Londonderry record of *G. odontogaster* was from flooded peat cuttings in a cutover bog (313). Lowland records predominated; there were only a few above 200 m, with the highest record at 410 m in Fermanagh (003).

The NILS data does not reveal any pattern of occurrence according to lake type. Southwood and Leston (1959) suggest the species prefers acidic conditions, but Savage (1989) denotes the species occurring across a wide range of pH and conductivities. *Gerris odontogaster* frequently was found with both of the other common *Gerris* species, *lacustris* and *argentatus*.

Halbert (1935) considered that the species was probably common. A record from the lakes at Fair Head in the extreme north of Antrim is included in this list. There are recent published Irish records from Kerry (Kirby 1983) and Cork (Kirby 1991).

## *Aquarius najas*



Total number of records 1 (0.5%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	-	0-99	1	Large lakes	0
0.25-0.99	-	100-199	0	Lakes	0
1-4.99	-	200-299	0	Reservoirs	0
5.0-9.99	-	300-399	0	Pools	0
10-249.99	-	400+	0	Rivers	1
250+	-	Max	60	Other	0

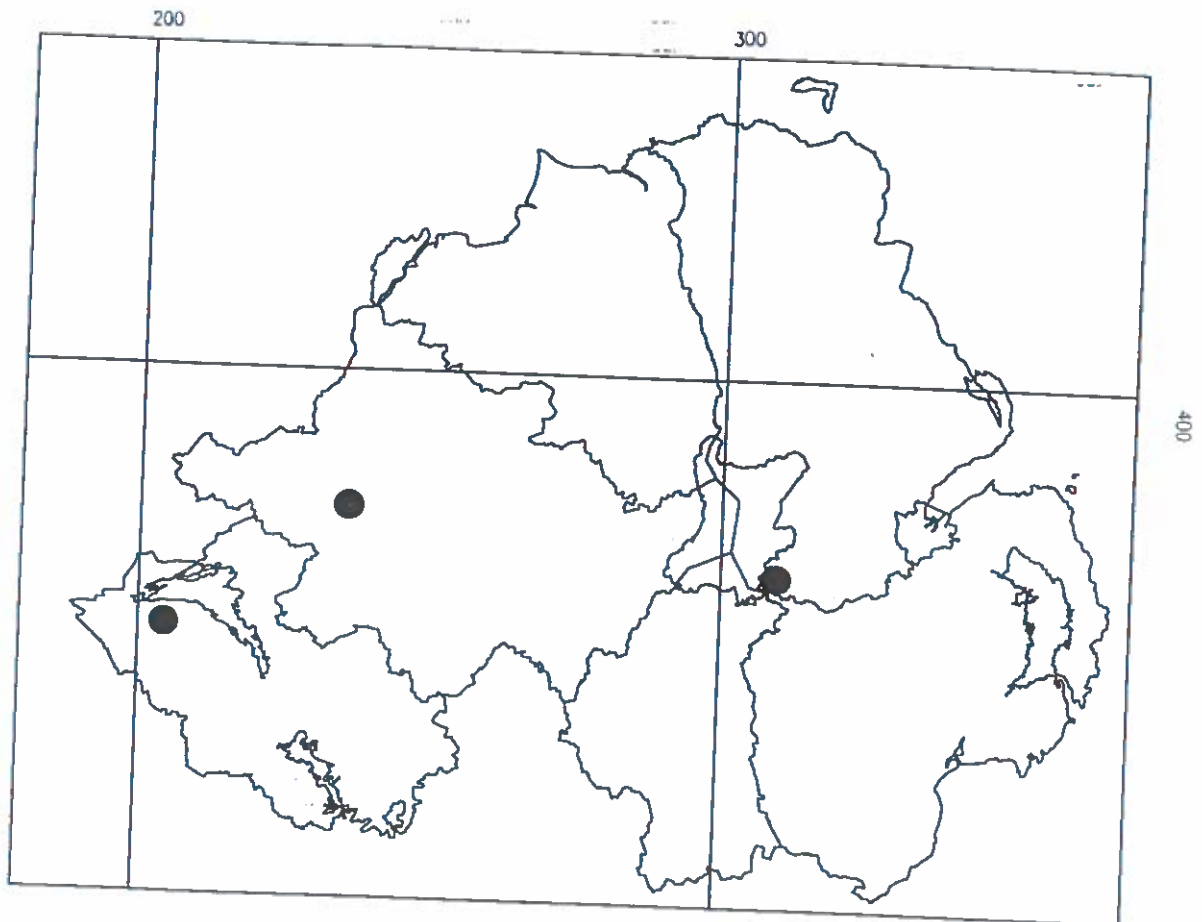
No information from NILS sites

### *Aquarius najas*

This was the least recorded gerrid species. However as rivers are the stated preferred habitat of *Aquarius najas*, this may simply be due to under-recording of rivers. Though *A. najas* is typically a riverine species, this large pondskater can also be found on lakes. It is found throughout Britain (Southwood and Leston 1959). Halbert (1935) gives records from the Cusher River, Armagh and the River Lagan at Lisburn. The species has been recorded from several localities in Kerry by Kirby (1983 and 1991) and the author (per. obs.). These sites ranged from sea level to 1850ft and included rivers and lakes.

*A. najas* was common on the River Blackwater at Benburb (282) on a stretch of the river of moderate flow upstream from the gorge.

## *Limnaporus rufoscutellatus*



Total number of records 3 (1%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	2	0-99	2	Large lakes	0
0.25-0.99	1	100-199	0	Lakes	1
1-4.99	0	200-299	1	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	2
10-249.99	0	400+	0	Rivers	0
250+	0	Max	210	Other	0

No information from NILS sites

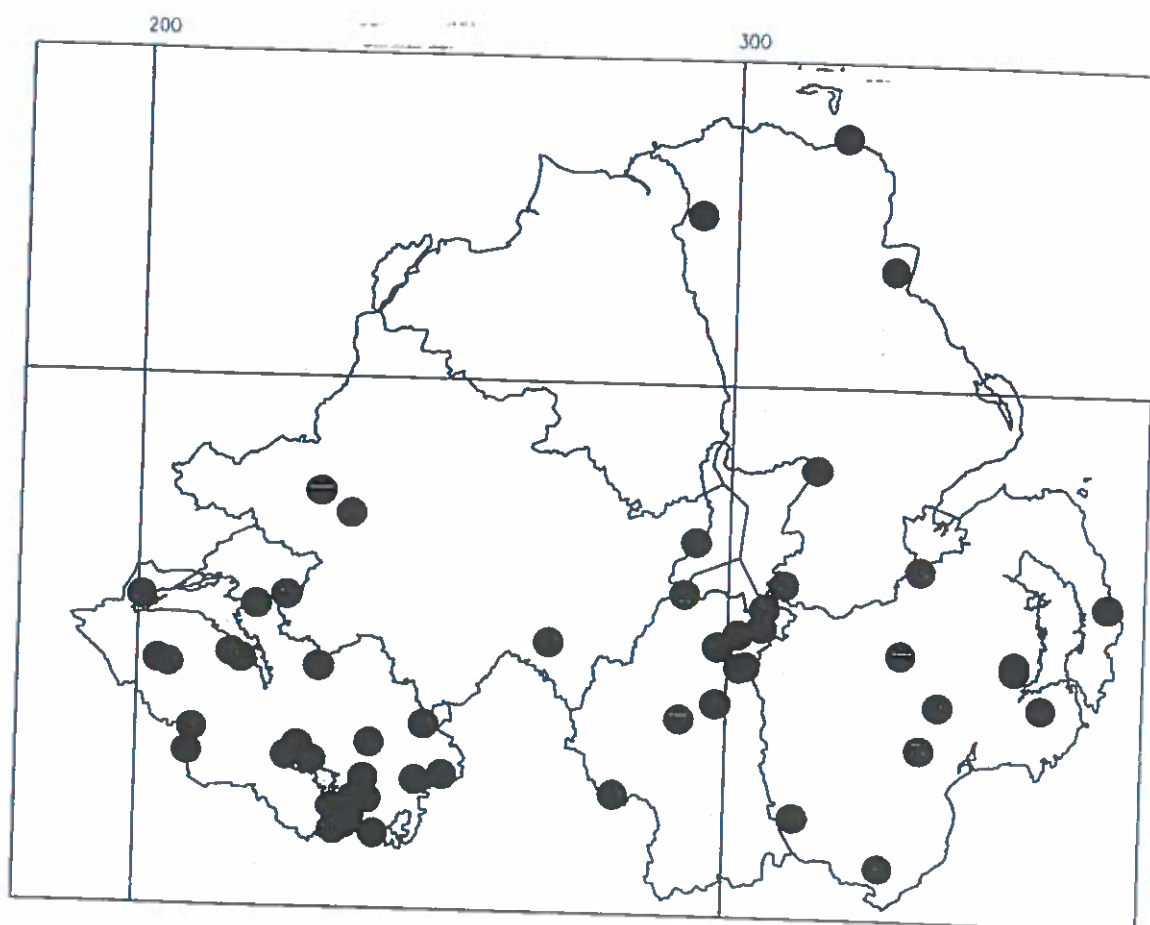
### *Limnopus rufoscutellatus*

This large pondskater is one of the few insects which is resident in Ireland but not in Britain. A few records of *Limnopus rufoscutellatus* from SE England are believed to be immigrants (O'Connor 1986). This is postulated from the dates of capture as none have been seen earlier than June (Southwood & Leston 1959). The indications from the number of Irish specimens and the dates of the records (mostly September) suggest that it is resident in Ireland. O'Connor (1986) gives records from the Killarney area and mentions that there is a single record from Clare. The status of the species however is still far from clear. Indeed Dolling (1991) even suggested that the species may be extinct.

Three records were made of *L. rufoscutellatus* during this survey. These were from single localities in counties Fermanagh, Tyrone and Antrim, which greatly extends the distribution of the species. Only single adult specimens were recorded at each locality. The Fermanagh site was a peaty pool in an area of heath (008); the Tyrone site was a small mesotrophic lake (050); and the Antrim locality a shallow peaty pool in an area of cutover raised bog (103). Two of the records were in June and one in late August.

No further visits were made to each locality, so the exact status of the species at each of the sites is not clear. However the number of records and their geographical spread would indicate that the species is resident in the area. It is however desirable to elucidate this as *L. rufoscutellatus* is one of the rarest and most notable species in the Irish aquatic insect fauna.

## *Nepa cinerea*



Total number of records 55 (23%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	12	0-99	40	Large lakes	4 (5sites)
0.25-0.99	8	100-199	9	Lakes	35
1-4.99	11	200-299	4	Reservoirs	0
5.0-9.99	4	300-399	1	Pools	12
10-249.99	12	400+	0	Rivers	0
250+	5	Max	340	Other	3 (QP, C, D)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	2	4	1	0	1	6	1	8	4



### *Nepa cinerea*

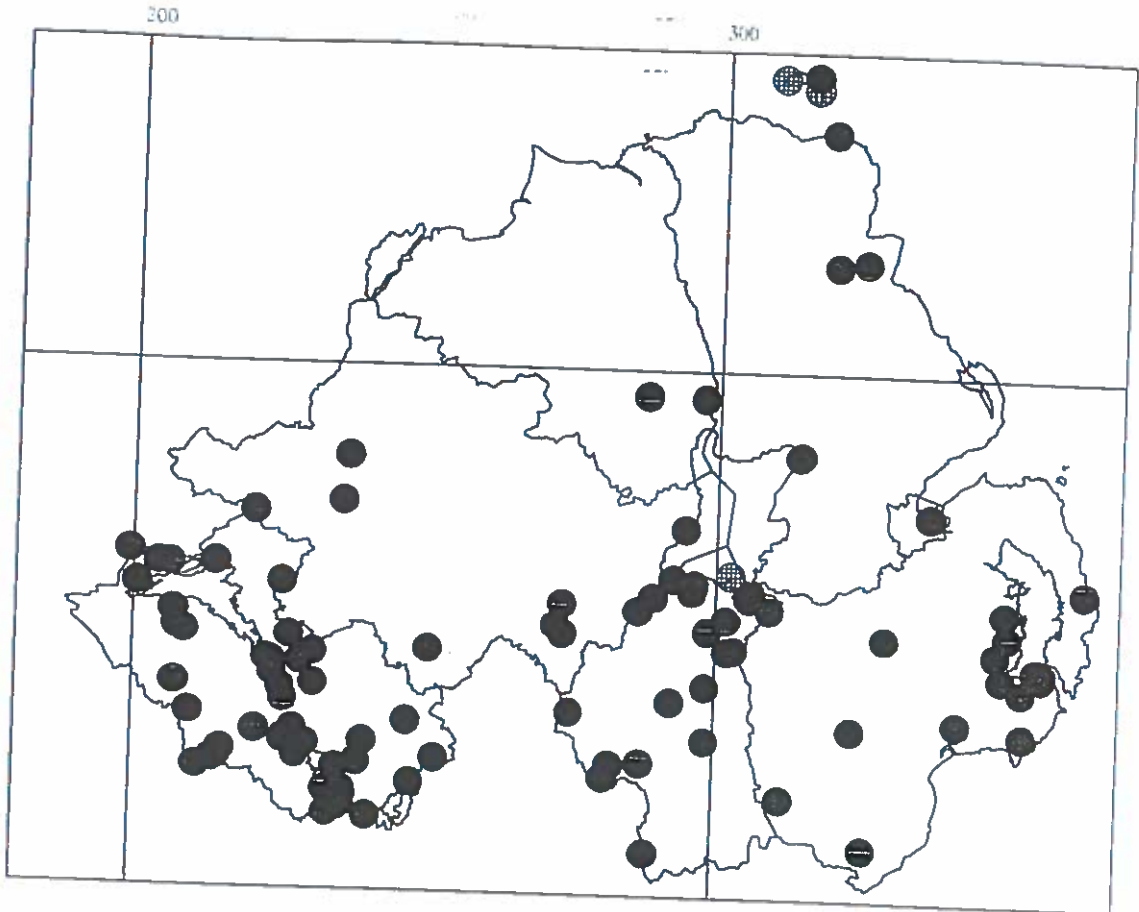
This is an instantly recognisable insect, even in its young stages, so no voucher specimens were taken. The only difficulty in recording it would come from its habit of feigning death and hiding amongst debris. Even so as it is a large insect even this would be unlikely.

*Nepa* was the second most frequently recorded species in the survey. It was found at 23% of the surveyed sites. It was recorded almost exclusively from still-water sites, and all except three records were from lakes or ponds. The other sites were a shallowly, flooded sandpit (136), a ditch linking two lakes (043) and a disused section of the Newry Canal (067). There were no records from rivers or reservoirs. The absence of records from the latter may be due to the nature of the sampling as these were predominately covered by NILS.

The NILS data indicates a preference for moderately eutrophic and mesotrophic lakes. It however also occurs in acid pools on cutover bogs. Apart from rapidly flowing water there would appear to be few open-water habitats not utilised by *Nepa*. Contrary also to Southwood and Leston (1959) who state that weeds are always present, it has also been recorded in shallow peaty pools with no aquatic vegetation. This includes two sites in N. Ireland (096, 143), and a site just outside the survey area in Leitrim.

The species occurred frequently at sites up to 200 m, but was rare above this. The highest site was at 340 m on the Garron plateau (294). Elsewhere in Ireland *Nepa cinerea* is common and generally distributed, extending to several of the offshore island in the west (Halbert 1935).

## *Notonecta glauca*



Total number of records 87 (37%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	19	0-99	63	Large lakes	5 (8 sites)
0.25-0.99	9	100-199	14	Lakes	50
1-4.99	18	200-299	4	Reservoirs	0
5.0-9.99	8	300-399	4	Pools	19
10-249.99	15	400+	2	Rivers	3
250+	8	Max	475	Other	7(QP, CL, C, D)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
2	2	7	5	1	3	5	3	7	6

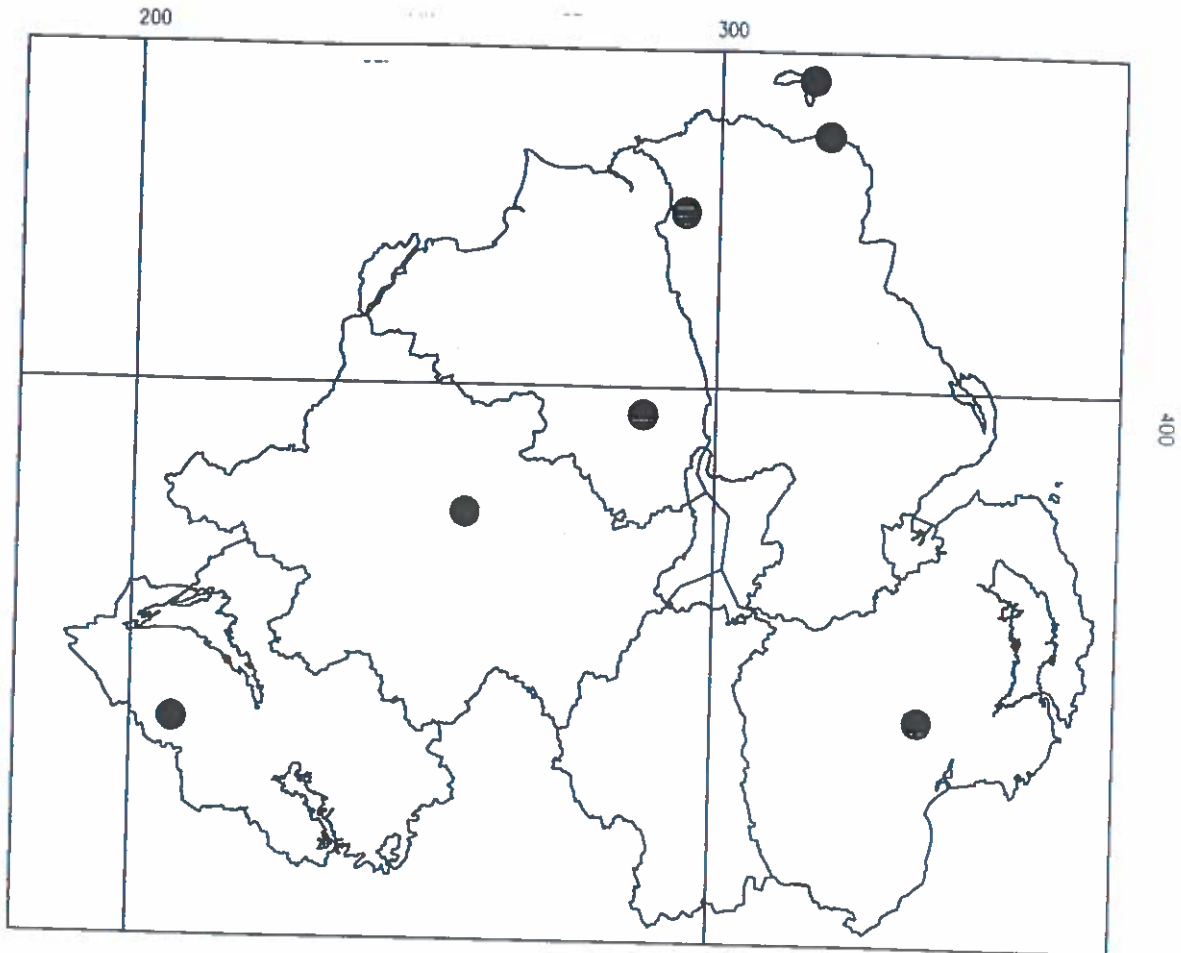
### *Notonecta glauca*

*Notonecta glauca* was the commonest species recorded. There were records from 87 sites. It was often abundant at individual sites. Specimens of this species were not taken as it is easily identified in the field.

The recorded distribution covered the entire province and most habitat types. The altitudinal range was the widest of any species, with records from sea-level to the highest site sampled at 475m. The only exception to this ubiquity was its notable absence from reservoirs. All these sites were covered by the lake survey yet no records were obtained. This may have been an artefact of the sampling at these sites. However the NILS samples provided 15 additional site records, so the sampling technique appears not to be biased against detecting this species. Neither would the explanation be lack of mobility because *N. glauca* is known to be a strong flier.

Elsewhere in its range in Britain and Ireland *N. glauca* is abundant. Halbert (1935) states it to be common and widespread. Other Irish records are given in Macan (1954), Flower (1982) and Kirby (1991).

## *Notonecta obliqua*



Total number of records 7 (3%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	4	0-99	3	Large lakes	0
0.25-0.99	1	100-199	3	Lakes	3
1-4.99	2	200-299	1	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	4
10-249.99	0	400+	0	Rivers	0
250+	0	Max	245	Other	0

NILS sites Chemical

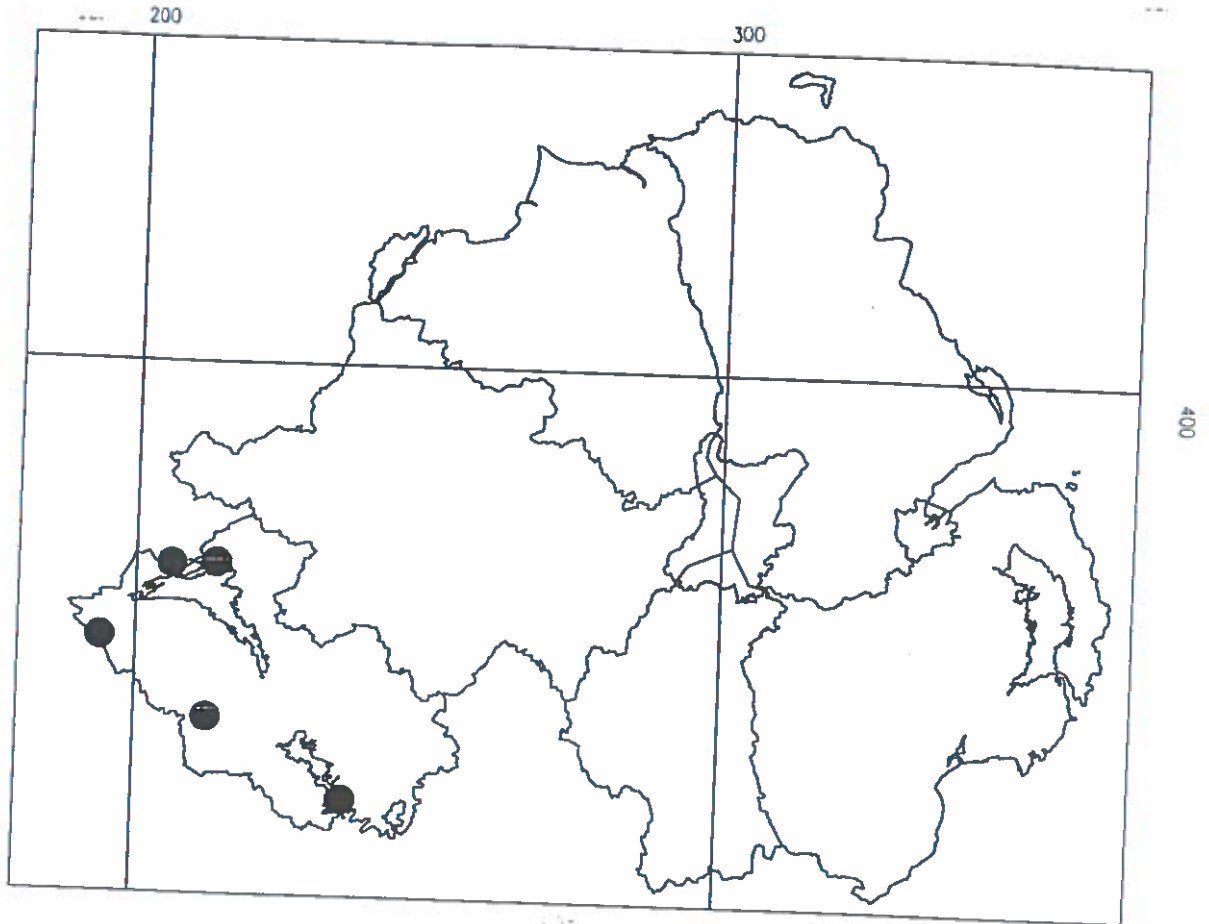
A	B	C	D	E	F	G	H	I	J
0	1	1	0	0	0	0	0	0	0

### *Notonecta obliqua*

Southwood and Leston (1959) states this species replaces *N. glauca* at high altitudes and suggest it is more tolerant of cold waters. The data from this survey indicate this is too simplistic an explanation. Most of sites at which *N. obliqua* was recorded were below 200m, whereas *N. glauca* was found at 10 sites above 200m and as high as 475m, which was the highest site sampled. As *N. glauca* is so widespread it is not surprising that the species overlap and at 3 out of the seven sites at which *N. obliqua* was found, *N. glauca* was also present. However at all the sites it was usually only single individuals of *N. obliqua* that were caught. The only exception to this was at the cutover bog at Curran (313), where *N. obliqua* accounted for 40% of the *Notonecta* caught in the many acid pools.

The species was very localised being found only on the north coast and on Rathlin Island, at one site each in Tyrone, Down, Londonderry and Fermanagh. Elsewhere in Ireland it has been found in oligotrophic lakes in Kerry, sea-level lakes and ponds on the Mullet peninsula in Mayo, a turlough in Mayo, pools in cutover bogs in Sligo and mesotrophic lakes in southern Donegal (pers obs).

## *Micronecta poweri*



Total number of records 5 (2%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	0	0-99	5	Large lakes	4 (4 sites)
0.25-0.99	0	100-199	0	Lakes	1
1-4.99	1	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	0
10-249.99	0	400+	0	Rivers	0
250+	4	Max	85	Other	0

No information from NILS sites

### *Micronecta poweri*

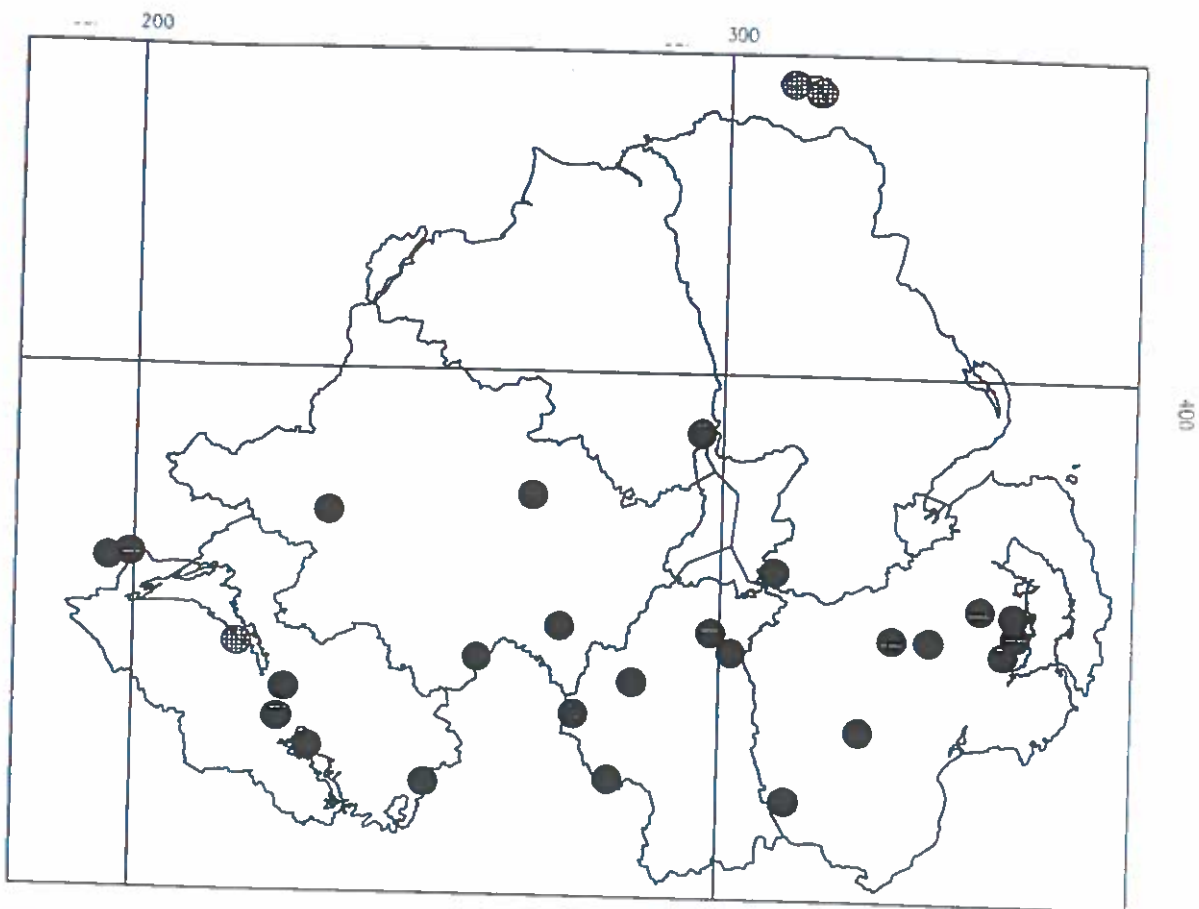
This, one of the smallest species of aquatic Heteropteran, apparently has one of the most restricted distributions. However its small size may mean it was under-recorded.

It was only recorded from sites in Fermanagh. Three of these were on shores of large lakes (031, 113, 288), the only exception being from Tullvoady Lough (110). All the sites were from areas of open water with fine gravel or stony beds. An additional record of juvenile *Micronecta* from Upper Lough Erne (287) is almost certainly referable to this species. This is mapped but it needs confirmation.

*Micronecta poweri* is a species of rivers and lakes in Britain. Sandy bottoms are a feature of many of the sites. It is stated to be intolerant of organic pollution (Southwood and Leston 1959). This may explain its distribution as the lakes in Fermanagh have suffered the least from eutrophication. Leston (1958) notes records from ten vice-counties spread throughout Ireland. Halbert (1935) mentions records from Toome, Antrim and the R. Faughan in Londonderry. During the study of the Killarney Lakes, O'Connor *et al* (1986) found it at several stations.

There are two additional species of *Micronecta* recorded from Britain and others in Europe, but none of these have ever been recorded from Ireland. *M. poweri* is one of the few widespread members of the genus, and is found from northern Finland to southern Spain (Jansson 1986).

## *Cymatia bonsdorffii*



Total number of records 23 (10.5%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	7	0-99	19	Large lakes	1 (1 sites)
0.25-0.99	1	100-199	3	Lakes	14
1-4.99	8	200-299	1	Reservoirs	1
5.0-9.99	0	300-399	0	Pools	7
10-249.99	5	400+	0	Rivers	0
250+	1	Max	230	Other	0

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	1	1	2	0	0	1	1	6	2



### *Cymatia bonsdorffii*

The male and female *Cymatia bonsdorffii* are one of the few corixids that can be distinguished in the field. The males have characteristic spiky, elongated forelegs and a domed head unlike any other Irish species. The females can be identified by the green colour to the underside. The species also differs from most in being solely predatory. It feeds on a wide variety of small invertebrates which it captures by ambush.

*C. bonsdorffii* was widely recorded in small lakes and ponds. The former were generally medium-sized lakes with the majority between 1 and 20 ha in extent, including some of the larger Down lakes (e.g. 115 and 187). One of the sites was an artificial lake at the mouth of the Moyola Water in Londonderry (275). As well as these lakes it was found at all the major cutover bogs and fens in Armagh and Down. In the western counties all the records were from lakes, including one site on Upper Lough Erne (140), which was the only record in this survey from one of the large lakes.

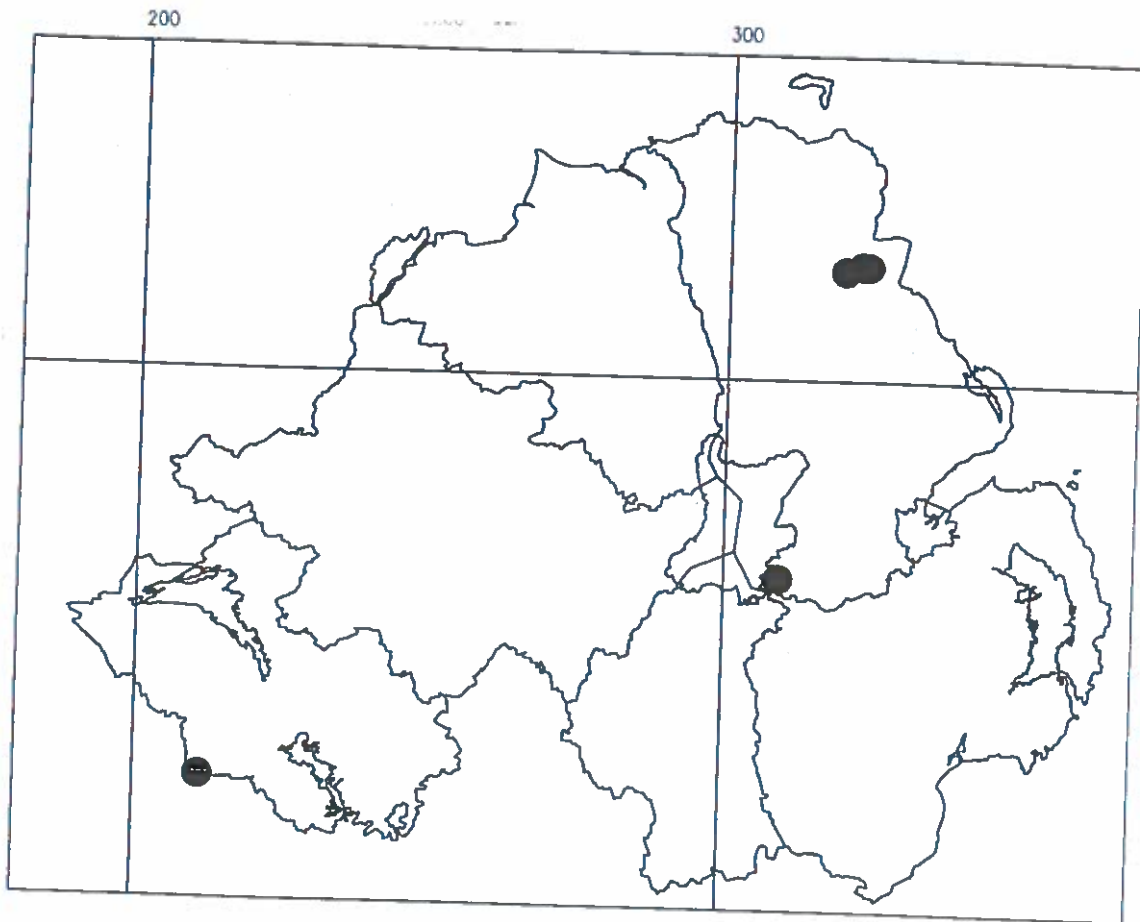
*C. bonsdorffii* is predominately a lowland species. 84% of records were from sites below 100 m; the highest locality it was recorded from was Loughaslane (256) at 230 m. Of the NILS sites sampled most were slightly eutrophic or mesotrophic lakes. There were no records from the most enriched categories.

Halbert (1935) considered *C. bonsdorffii* to be 'widely distributed and common'. He listed a few records from Armagh, Down and Antrim. Twenty vice-counties had records in Leston's list (1958), including Fermanagh. Neither Kirby (1983) nor O'Connor *et al* (1986) contain records of the species from the Killarney area. Macan (1954) did record it from one site on Lower Lough Erne and Flower (1982) recorded it from one lake and a pond on Rathlin Island.

According to Southwood and Leston (1959) *C. bonsdorffii* is found in lakes and ponds, particularly those with macrophytes, throughout Great Britain apart from the south-east. The European distribution covers most of northern and central Europe (Jansson 1986). It is one of the commonest species in acidified lakes in Scandinavia (Savage 1989).

A second species of *Cymatia*, *coleoprata*, is found in southern England and Wales, but has never been recorded in Ireland.

## *Glaenocorisa propinqua*



Total number of records 5 (2%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	2	0-99	1	Large lakes	0
0.25-0.99	1	100-199	0	Lakes	3
1-4.99	2	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	3	Pools	2
10-249.99	0	400+	1	Rivers	0
250+	0	Max	475	Other	0

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	0	2	0	0	0	0	0	0	0

### *Glaenocorisa propinqua*

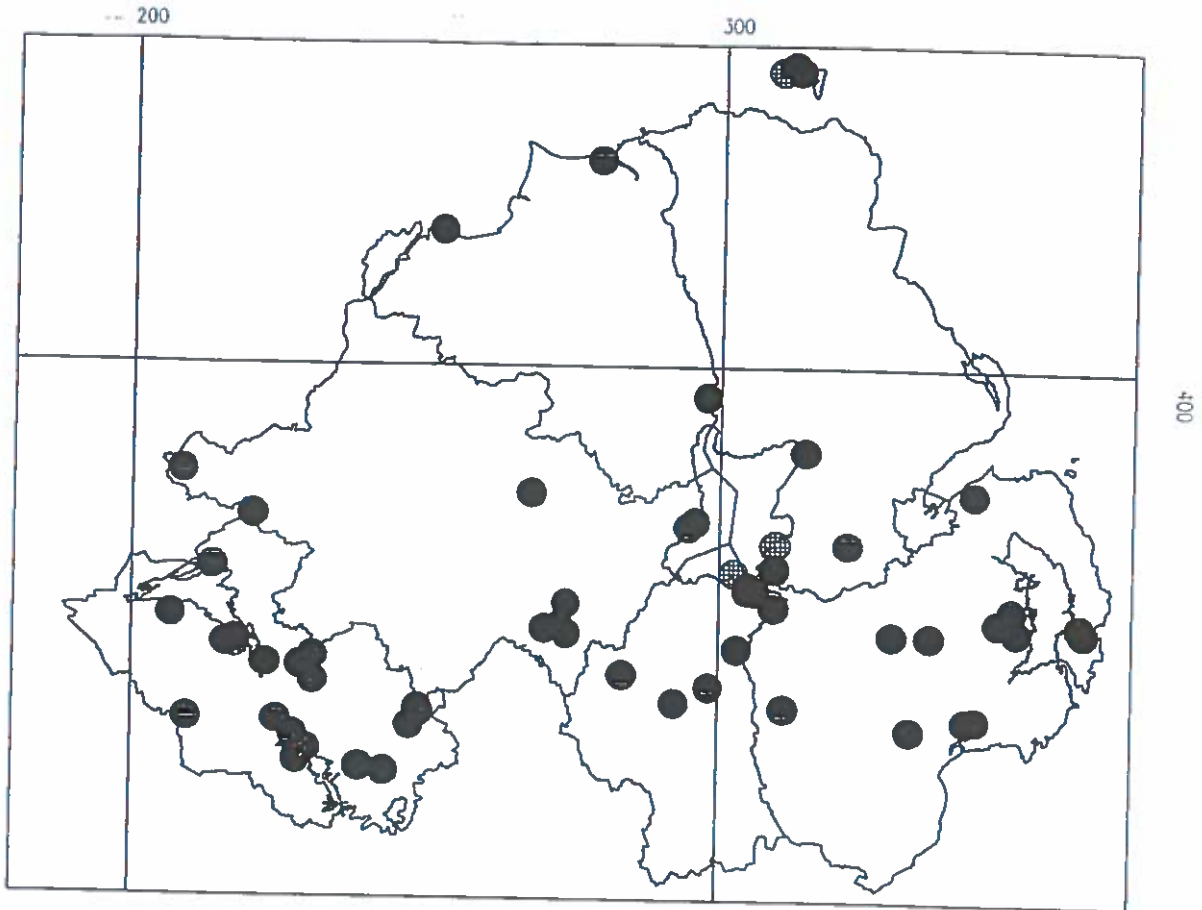
This is one of the most interesting species of corixid found in N. Ireland. It is a local species in Britain with two apparently separate populations in the south of England and from north Wales northwards to northern Scotland (Southwood and Leston 1959; Jansson 1986). It has a markedly north-western distribution in Europe, from north-eastern France to Finland with a few apparently isolated populations in central Europe (Jansson 1986). *G. propinqua* exists in two subspecies which intergrade where they meet. The southern populations are subspecies *propinqua* and this has been recorded from eastern Ireland (Jansson 1986). The northern part of the range is occupied by subspecies *cavifrons*. The forms can be separated by the shape of the male forelegs. All the specimens found in N. Ireland were referable to *cavifrons*.

*G. propinqua* was recorded from 5 sites. Four of these were in Antrim, with a single record from Fermanagh (267). Three of the Antrim sites were on the Garron plateau (093, 094, 102); the fourth was from a cutover bog, Montiaghs Moss (103). The latter is the most interesting record as it is a lowland site. The other records are more typical upland lakes and pools. In upland localities *G. propinqua* was typically found with *Arctocorisa germari* and/or *Callicorixa wollastoni*.

Two of the sites were covered by NILS. Both were classified as being type C lakes which is the base-poor, clear, upland lake category. Whilst it was not recorded from the Mourne, potential sites here have not all been covered and there is a possibility it may be found here as well as other upland areas. Most lowland bogs were covered without producing additional records. The Montiaghs Moss site is therefore of great interest as it represents a relict and possibly unique Irish population and worthy of further survey and protection.

*G. propinqua* was first recorded in Ireland from near Killarney, Kerry in 1929 (Halbert 1935). Additional records from Galway and Donegal are shown in Leston (1958). The Donegal record is that published in Macan (1954). Kirby (1983) published two additional Kerry records. A record from eastern Ireland is mapped in Jansson (1986). The five records here double the number of recorded Irish sites and significantly extends its distribution.

## *Callicorixa praeusta*



Total number of records 54 (23%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	2	0-99	35	Large lakes	5 (12 sites)
0.25-0.99	0	100-199	12	Lakes	34
1-4.99	6	200-299	6	Reservoirs	2
5.0-9.99	0	300-399	1	Pools	2
10-249.99	1	400+	0	Rivers	0
250+	12	Max	305	Other	4(C, CL, FQ)

### NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	3	3	1	0	5	8	1	8	0

### *Callicorixa praeusta*

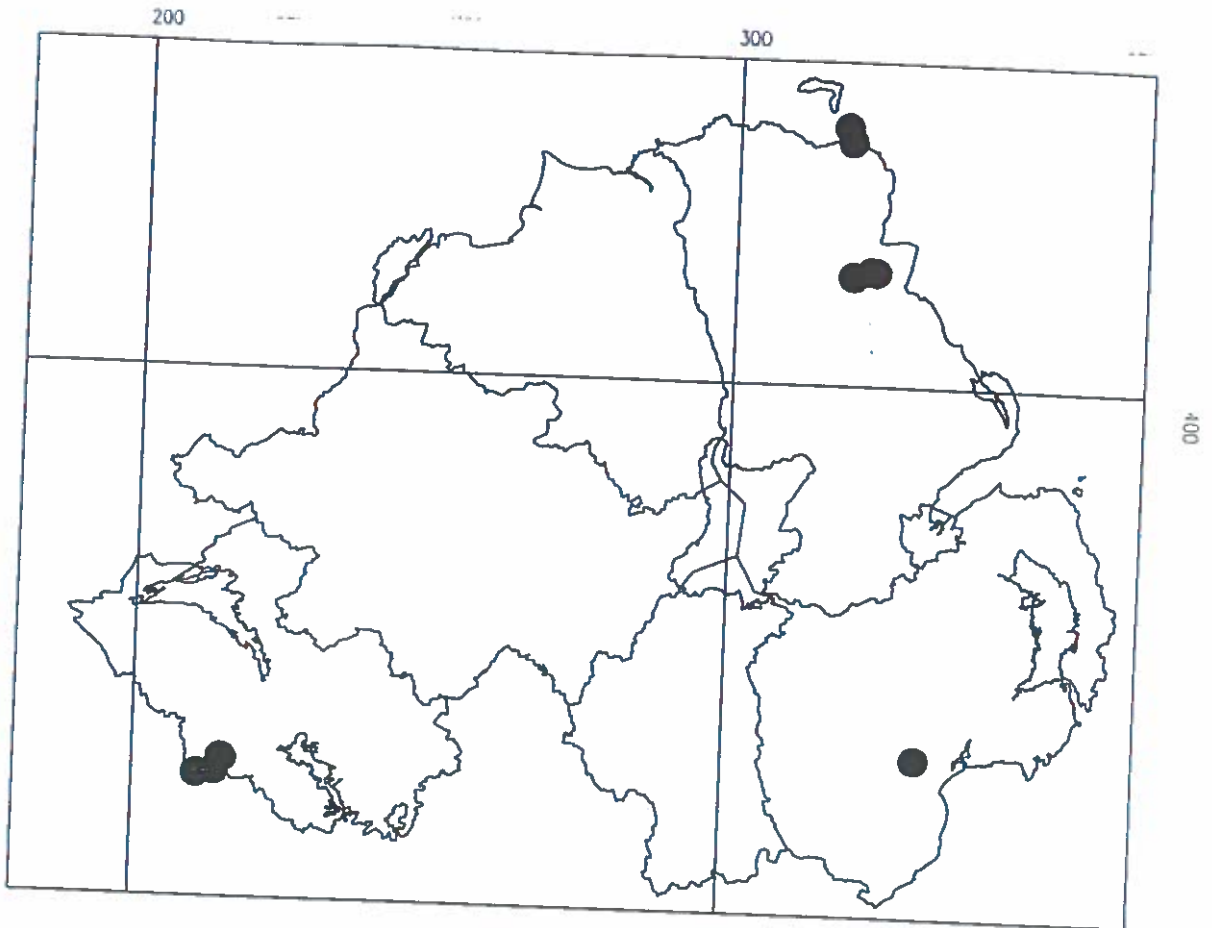
This was one of the most widely distributed species. It was the most frequently recorded corixid and the third most frequent species of the whole group. Records came from all counties and also Rathlin Island. The results indicate that in Northern Ireland *Callicorixa praeusta* is predominately a lake species. Most of the records were from small lakes (under 10 ha) but the distribution also included all of the major large lakes which were covered in the survey. *C. praeusta* was only recorded from a few pools including one cutover bog site (103), an artificial pond close to Lough Neagh (063) and a heathland pool on Rathlin I (097). Additionally it was found in two reservoirs (243 and 269), two coastal sites (074 and 215), a flooded quarry (226) and a disused canal (067). The majority of the recorded sites were lowland (65% below 100m); the few records above 200m related to the base-poor lakes.

The NILS sites indicate a preference for the eutrophic lake categories, particularly groups F and G. However, it also occurred in base-poor lakes (type B and C) in Fermanagh and Tyrone.

Macan (1966) stated that *C. praeusta* avoided small and large lakes preferring those of intermediate size. However, Savage (1982) could find no correlation with size of the lake and the occurrence of the species. His results showed that conductivity was the most significant factor controlling its presence, with the species becoming more common at higher conductivities. This does not correspond with the N. Irish data as *C. praeusta* was the most frequently recorded species in the type F and G lakes, which though the most eutrophic categories, are not of high conductivity. A significant proportion of the records were also from mesotrophic categories B and C which had amongst the lowest conductivities of any of the NILS types.

Previous records of *C. praeusta* in Ireland show a wide distribution. Halbert (1935) stated it to be common and widely distributed. His records however included *C. wollastoni* which at that time had not been recognised as specifically distinct. Of the Northern Irish counties, only Tyrone lacked a record in the list produced by Leston (1958). In the Killarney area *C. praeusta* is apparently rare, only recorded from one locality by Kirby (1983). O'Connor *et al* (1986) only recorded it from the most eutrophic site in their study of the Killarney lakes. It is a common and widespread species in Britain, usually requiring some degree of organic pollution (Southwood & Leston 1959). In Europe *C. praeusta* is found in central and northern areas and across central Asia to the Pacific (Jansson 1986).

## *Callicorixa wollastoni*



Total number of records 10 (4%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	4	0-99	0	Large lakes	0
0.25-0.99	0	100-199	2	Lakes	6
1-4.99	6	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	6	Pools	4
10-249.99	0	400+	2	Rivers	0
250+	0	Max	424	Other	0

NLS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	0	3	0	0	0	0	0	0	0

### *Callicorixa wollastoni*

This is the rarer of the two *Callicorixa* species which are found in Ireland. *C. wollastoni* replaces *C. praeusta* at upland and in unproductive sites. There is however some overlap in their altitudinal distribution though the species were never found together. The distribution of this species is clearly related to altitude; it was the only species not recorded at sites below 100m. *C. wollastoni* was found in suitable habitat on the Garron plateau, in the Mourne Mtns. and on Cuilcagh in Fermanagh. Most of the sites were above 300m, the only exception being two sites at Fair Head (090 and 091).

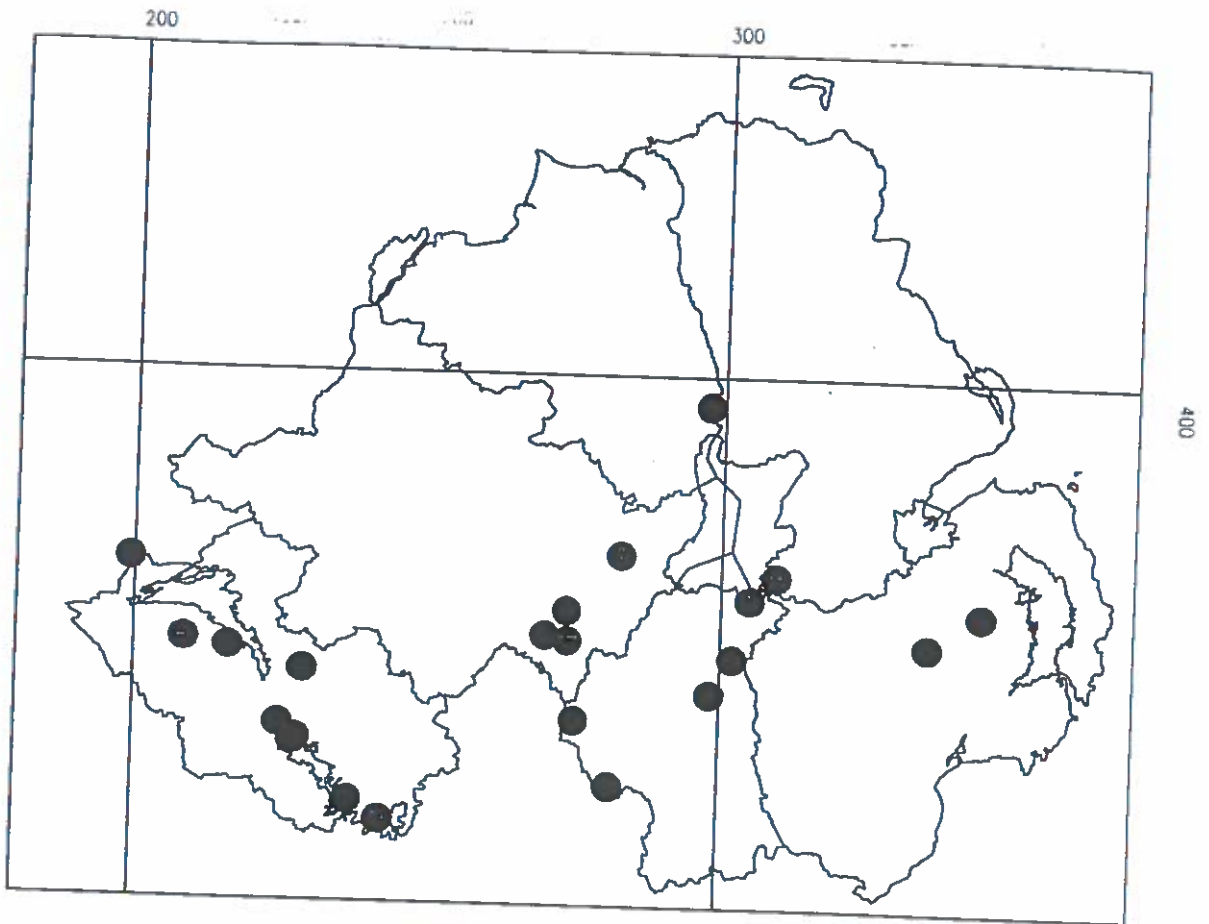
As well as the altitude of the site, size is clearly a major factor as *C. wollastoni* shows a preference for small lakes and pools. It was notably absent from the large lakes on the Garron and the other montane areas where the other upland species such as *Glaenocorisa propinqua* and *Arctocorisa germari* were found. All the recorded sites were either small ponds or lakes less than 2 ha in extent. The species was occasionally the only corixid found at some of the smaller pool sites. In the lakes it occurred with *G. propinqua* and *Hesperocorixa sahlbergi* in particular. This avoidance of large sites may be related to fish predation, which is known to effect the corixid fauna of lakes (Savage 1989).

As was the case for *G. propinqua* the NILS information indicates a distribution limited to type C lakes, which again shows overlap with *C. praeusta*. However *C. praeusta* occurred in more lowland examples of this type.

Leston (1958) suggested a coastal distribution for *C. wollastoni* in Ireland. This however is simply an artefact of the vice-county maps as the upland areas in Ireland are mainly found in vice-counties on the coast. Leston (1958) mapped records for Armagh, Londonderry and Down within N. Ireland. The Londonderry records are those mentioned in Halbert (1935), though these refer to a lowland site. There is however no reason why, given suitable habitat, *C. wollastoni* will not be found in the Sperrins. The Slieve Gullion area of south Armagh is the only other upland region which was not surveyed but is an area in which it is known that suitable small lakes do occur.

Kirby (1983) recorded *C. wollastoni* commonly in the Killarney area in bog pools and loughs up to 2600 ft. In Britain it occurs throughout Scotland, but is confined to the main upland areas of England and Wales. It has a restricted distribution in Europe and outside Britain and Ireland, it only occurs in the Faeroes and in Fennoscandia (Jansson 1986).

## *Corixa dentipes*



Total number of records 21(9%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	3	0-99	16	Large lakes	2 (3 sites)
0.25-0.99	0	100-199	5	Lakes	15
1-4.99	6	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	3
10-249.99	1	400+	0	Rivers	0
250+	3	Max	175	Other	0

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	0	1	1	0	1	4	1	5	2



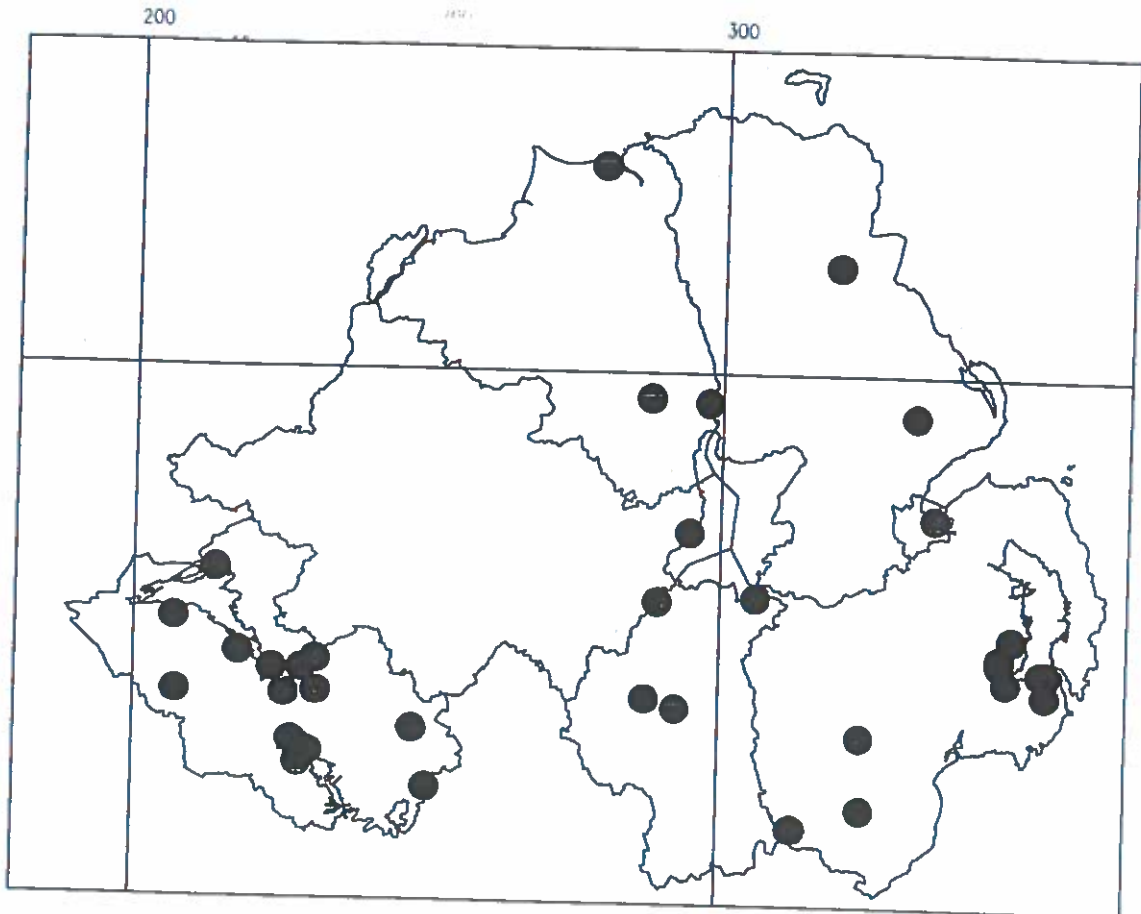
### *Corixa dentipes*

*Corixa dentipes* is one of the three large members of the genus along with *C. punctata* and *C. iberica*. Despite it being the most easily distinguished of the three it was only recognised as occurring in Britain in 1928 (Southwood and Leston 1959). Halbert (1935) in his account of the Irish Hemiptera, listed only three records. It was not recorded by Kirby (1983) or O'Connor *et al* (1986) in Kerry. The European distribution covers central Europe and southern Scandinavia and Finland (Jansson 1986).

*C. dentipes* was recorded from 21 sites. These were mainly lake sites including L. Neagh, Lower L. Erne and L. Beg. The pond records were from a fen (056), a cutover bog (103) and an area of acid heath (177). The distribution has a southern and western trend, with the majority of records from Armagh, SE Tyrone and the Erne valley in Fermanagh. There were few records from Down, Londonderry or Antrim.

The NILS data indicates a strong preference for the eutrophic, lowland lake categories. *C. dentipes* was most frequently recorded at low to mid-altitude sites, with the highest record at just 165m (177). This contrasts with *C. punctata* which was found at much greater altitudes and which was not so restricted to eutrophic sites.

## *Corixa punctata*



Total number of records 33 (15%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	6	0-99	22	Large lakes	4 (5 sites)
0.25-0.99	6	100-199	5	Lakes	17
1-4.99	6	200-299	2	Reservoirs	1
5.0-9.99	1	300-399	3	Pools	6
10-249.99	3	400+	0	Rivers	0
250+	5	Max	310	Other	4 (CL, FQ)

### NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
1	1	2	1	1	0	2	2	1	1

## *Corixa punctata*

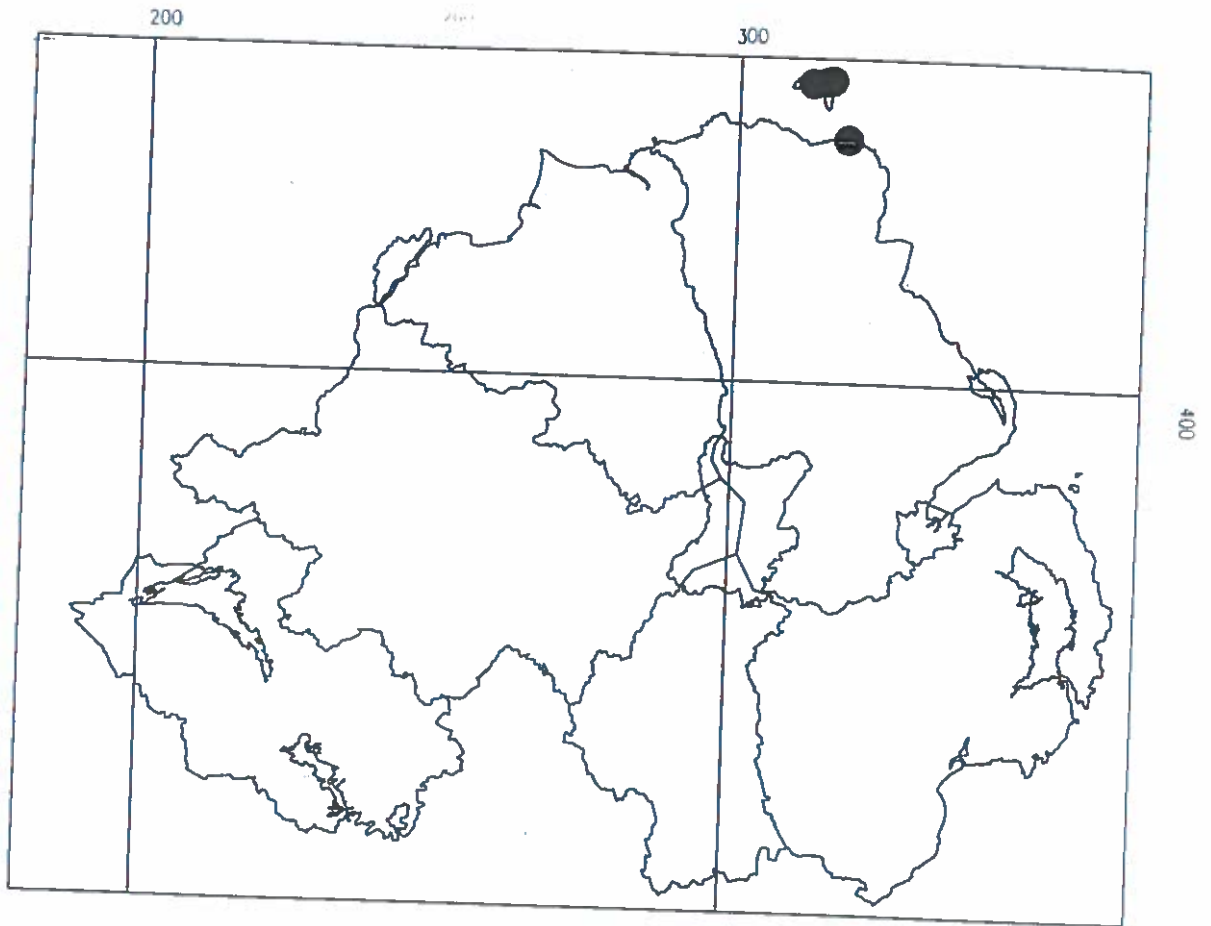
*Corixa punctata* was the most commonly recorded of the three large *Corixa* species, which are the largest species of corixids. It was recorded from all six counties and in all habitats excluding rivers. The range of habitats occupied includes brackish lakes, sheltered bays on the large loughs, peaty pools and upland lakes. It was also recorded from two artificial sites, a flooded quarry(227) and a reservoir (898). Records came from Upper and Lower Lough Erne, Lough Beg and Lough Neagh. Concentrations of records are apparent from the map around Upper and Lower Lough Erne and the south-west corner of Strangford Lough. However, in general the species shows a more scattered distribution than that of the other common *Corixa* species, *C. dentipes*.

The majority of the records were from lowland sites but it was recorded at small loughs at 305m on the Garron plateau (088) and in Fermanagh (029), and in a small pool at 310 m (280) in the Mournes. The NILS data does not show any strong correlation with lake type, and *C. punctata* was found at sites in all of the chemical types except type F.

Leston (1958) and Halbert (1935) give records from a total of 17 vice-counties and the latter described it as very common wherever it is found. Southwood & Leston (1959) also described it as often being very common. Whilst widespread in this region, numbers recorded at individual sites were usually small. Habitats mentioned in the literature include brackish sites, weedy ponds and lowland rivers plus temporary pools. This covers many of the habitats in the north but excludes the main habitat type.

*Corixa punctata* is found in western, central and southern Europe as far north as northern Scotland and southern Scandinavia. The distribution is more southern than that of *Corixa dentipes* (Jansson 1986).

## *Corixa iberica*



Total number of records 5 (2%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	5	0-99	4	Large lakes	0
0.25-0.99	0	100-199	1	Lakes	0
1-4.99	0	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	5
10-249.99	0	400+	0	Rivers	0
250+	0	Max	185	Other	0

No information from NILS sites.

### *Corixa iberica*

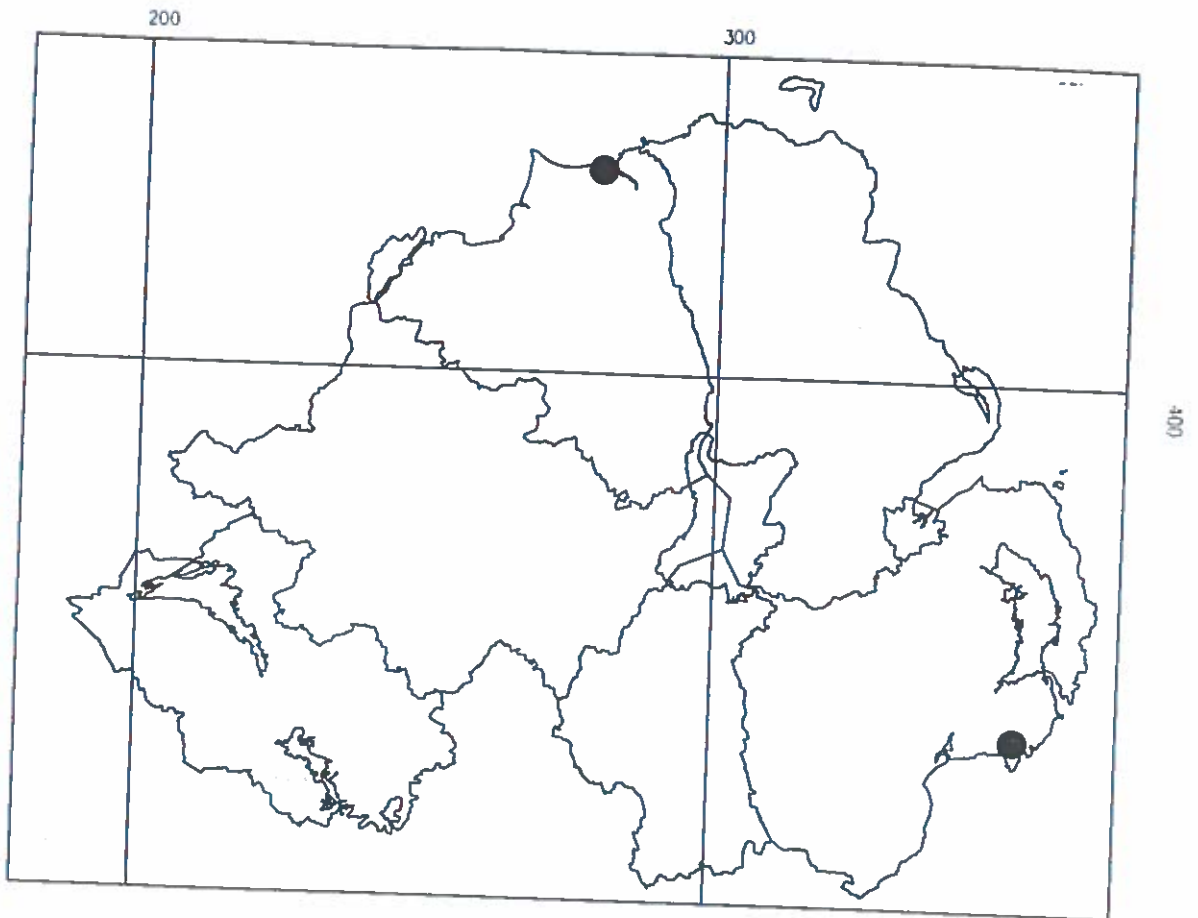
Of the three species of large *Corixa* found in N. Ireland, this species is by far the rarest. The existence of *C. iberica* was not recognised until the 1980s when it was described from Spanish specimens as a new species, distinct from *C. punctata* (Jansson 1986). An examination of Irish material of *C. punctata* confirmed its presence in Ireland. Apart from the SW quarter of the Iberian peninsula, and western Ireland, it is also now known to occur in western and northern Scotland and western Norway. The identification of the species, which is keyed out in Savage (1989), is not difficult when adult males are available.

*C. iberica* was recorded from five sites, all in the extreme north-east of Antrim. Four of the records are from Rathlin Island with a solitary record on the adjoining mainland on the Fair Head plateau. Here it was found in a pool in the floating scraw at the southern end of Lough Fadden (090). This was the highest site at which it was recorded as all the Rathlin sites are below 50m above sea level.

The sites were all small pools in acid and maritime heath. On Rathlin, two sites were close to the East Light (086 and 087), and the other two were in Knockans townland in the centre of the island's western arm (097 and 098). The pools were either unvegetated or with poor fen around the margins with *Eleocharis palustris* and *Carex rostrata*. At the five sites *C. iberica* coexisted with a mixture of lake and pool species, including *Sigara scotti*, *S. concinna*, *Hesperocorixa sahlbergi*, *Callicorixa praeusta*, and *C. wollastoni*.

*C. iberica* appears to be the extreme Atlantic counterpart of *C. punctata* in the north of its range, perhaps with a requirement for the mild, climatic conditions found in maritime areas. However in the southern part of its range, in Portugal and Spain, it occurs inland (Jansson 1986). Whatever the controlling factors it appears that *C. punctata* is absent from the areas with *C. iberica*, and the latter species is distinct ecologically as well as morphologically. Another idea postulated by Dolling (1991) to explain the distribution of the two species, is that *C. punctata* may be in the process of replacing *C. iberica*, which only exists now in relict populations at the western edge of Europe.

## *Corixa panzeri*



Total number of sites 2 (1%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	-	0-99	2	Large lakes	0
0.25-0.99	-	100-199	0	Lakes	0
1-4.99	-	200-299	0	Reservoirs	1
5.0-10.99	-	300-399	0	Pools	0
10-249.99	-	400+	0	Rivers	0
250+	-	Max	5	Other CL	1

NILS sites Chemical  
Only site type I

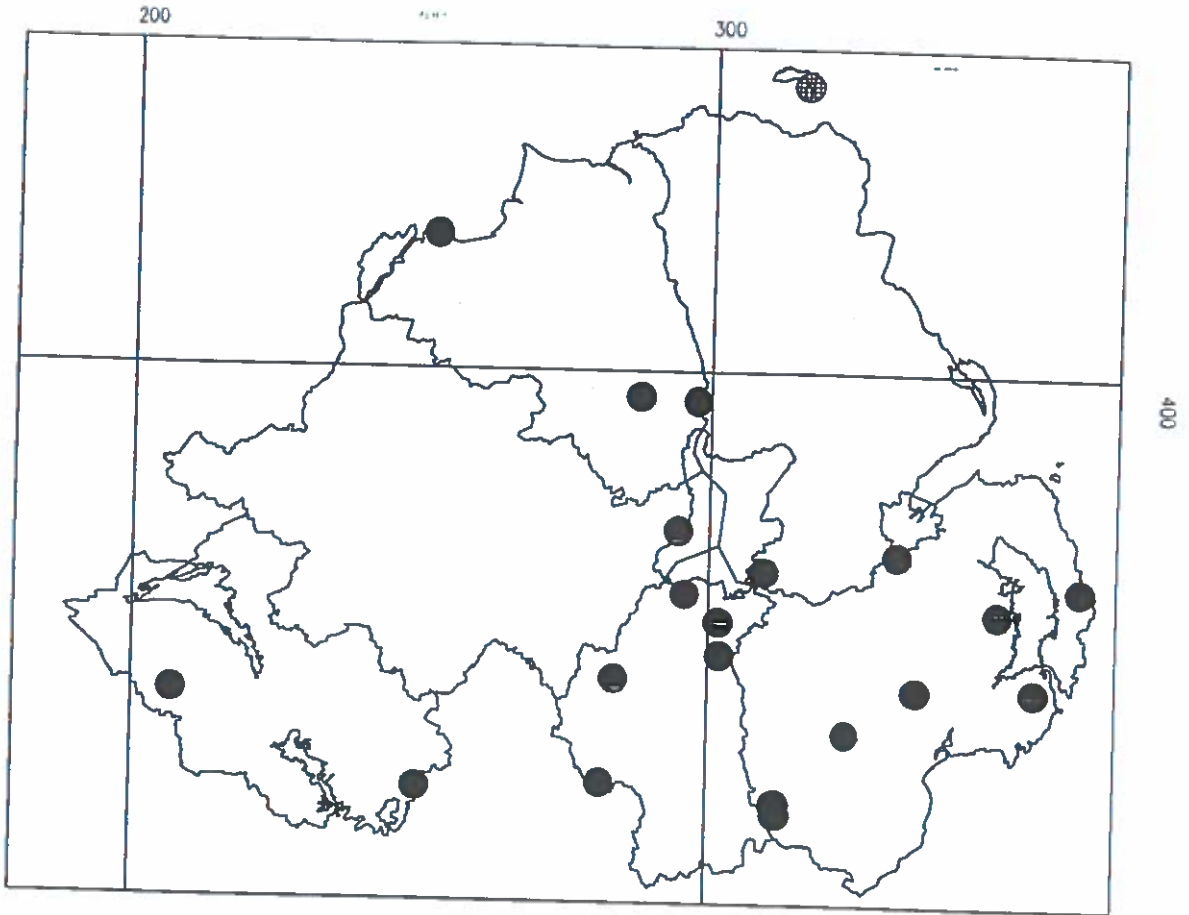
### *Corixa panzeri*

*Corixa panzeri* was the rarest of the four *Corixa* species recorded. It is one of the two small species of the genus recorded from Ireland. The second, *C. affinis*, has only been recorded from scattered sites in southern and western counties (Halbert 1935; Leston 1958). Leston (1958) listed 9 vice-counties with records of *C. panzeri*.

There were two records of *C. panzeri*, both from coastal localities. One was from a pool at the Bann estuary (211A); the second was from a flooded clay pit, which is now a reservoir, at Killough (246; R. Weyl). In this region the species shows the same coastal bias which is apparent from Halbert (1935). Southwood and Leston (1958) state that *C. panzeri* will occur in brackish sites, but that it is widespread throughout Britain. The latter, however, is not supported by the map shown in Jansson (1986), which shows a southern and coastal distribution.

On continental Europe *C. panzeri* has a predominately coastal distribution (Jansson 1986), and so its Irish distribution fits this European pattern. This would suggest the Irish distribution is not linked to climatic factors, unlike many other insect species which are widespread in southern areas, and which become confined to climatically favourable areas on the coast towards the north of their range. This corixid species therefore appears to have some requirement for coastal and possibly brackish conditions. If this is true then *C. panzeri* will undoubtedly prove to be rare in N. Ireland as there are few areas with suitable habitat.

## *Hesperocorixa linnaei*



Total number of records 20 (9%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	9	0-99	17	Large lakes	2(2)
0.25-0.99	1	100-199	2	Lakes	7
1-4.99	5	200-299	1	Reservoirs	0
5.0-9.99	1	300-399	0	Pools	9
10-249.99	0	400+	0	Rivers	0
250+	2	Max	245	Other	2 (QP, CL)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	1	0	0	0	0	1	0	0	5



### *Hesperocorixa linnaei*

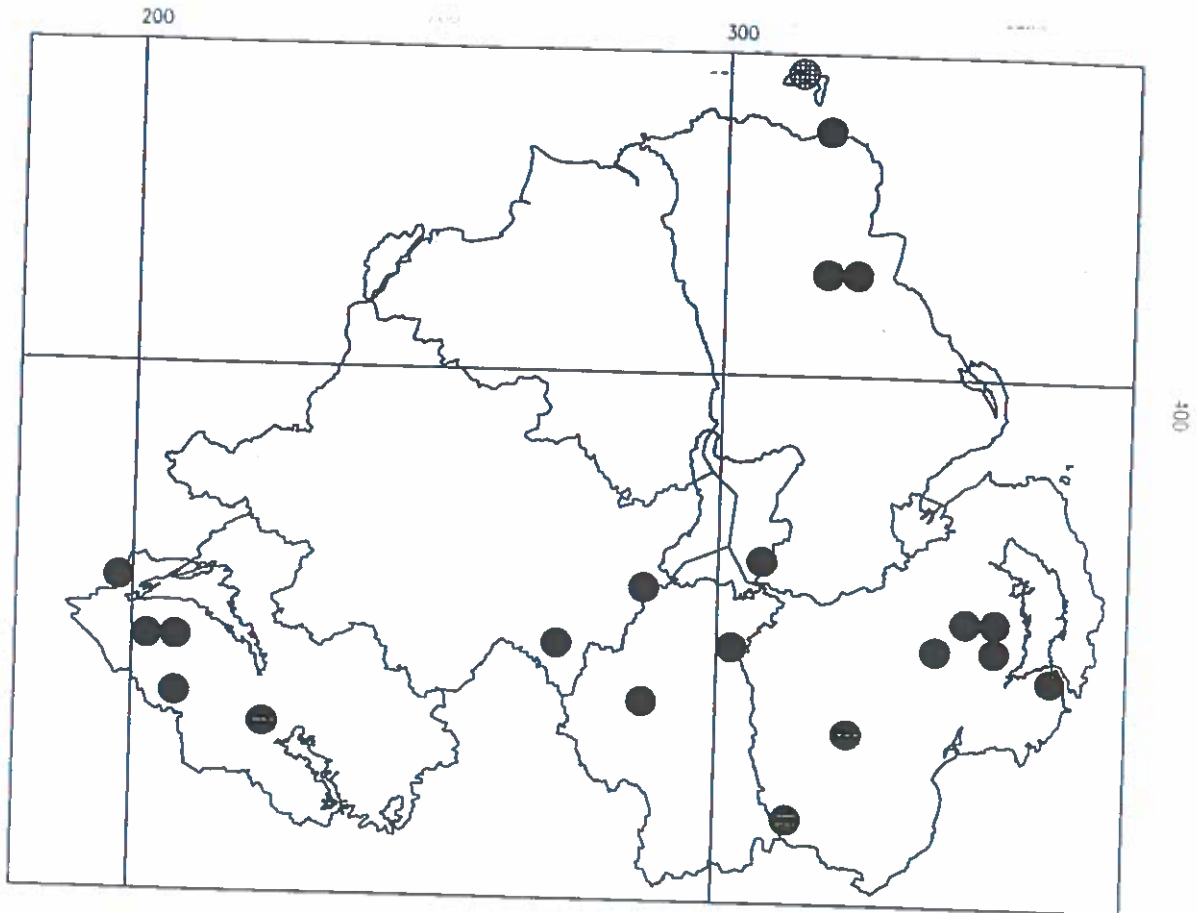
The distribution of *Hesperocorixa linnaei* shows a south-eastern pattern. Most of the records came from Down and Armagh. It is however found in scattered localities in all other counties and there is a recent record from Rathlin Island (Flower 1982). The majority of records were from lowland sites below 100m.

The habitat data shows an almost equal split between pond and lake sites. As well as small lakes it was found in two of the large lakes, Lough Neagh (116) and L. Beg (108). Seven of the lake sites were covered by NILS and five of these were type J, which is a lowland, mesotrophic or slightly eutrophic category. The pond records include acid bogs and fens mostly in the east of the province. At three of these sites it occurred with *H. sahlbergi*, but mostly the two species had separate distributions. As well as lakes and ponds, *H. linnaei* was also found in a flooded quarry (226) and a brackish pool (211A).

The European distribution of *H. linnaei* is similar to that of *H. sahlbergi*. The species is found throughout Britain (Savage 1989) and there are records from scattered localities throughout Ireland (Leston 1958). It is found in stagnant water with reed-beds including brackish sites (Southwood and Leston 1959).

In the eutrophic lakes in the west Midlands, *H. linnaei* replaces *C. praeusta* and is in turn replaced by *H. sahlbergi* in the most eutrophic sites (Savage 1989). This is supported by the data from NILS sites, to the extent that *H. linnaei* was not recorded from the most eutrophic lake categories.

## *Hesperocorixa sahlbergi*



Total number of records 21 (9%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	8	0-99	13	Large lakes	0
0.25-0.99	3	100-199	3	Lakes	12
1-4.99	5	200-299	2	Reservoirs	0
5.0-9.99	2	300-399	3	Pools	8
10-249.99	2	400+	0	Rivers	0
250+	0	Max	345	Other	1 (QP)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	0	2	1	0	0	1	1	3	1

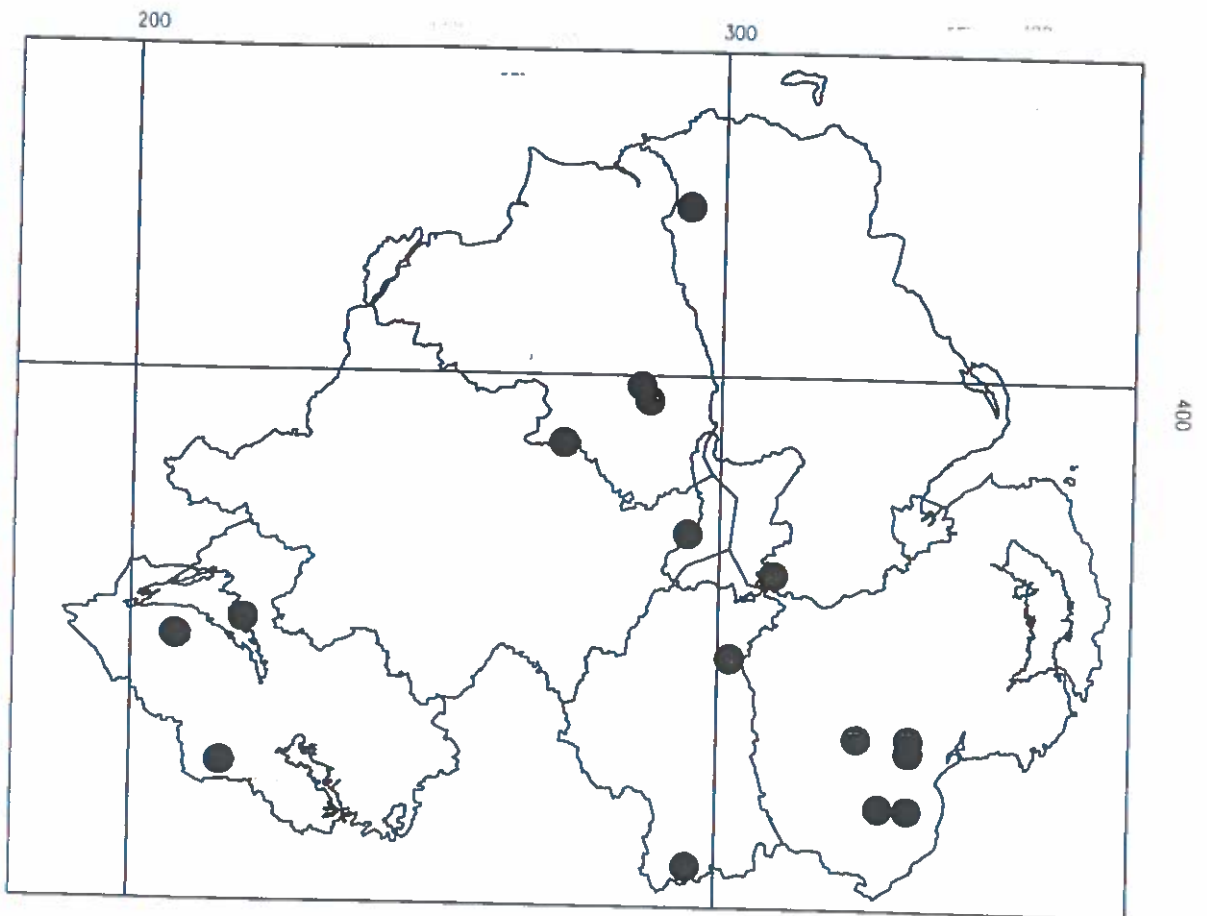
### *Hesperocorixa sahlbergi*

*Hesperocorixa sahlbergi* was locally distributed in all counties except Londonderry. The record mapped for Rathlin Island is published in Flower (1982). It was less restricted to the south-east than *H. linnaei*. Though lakes were the predominant habitat type utilised the sites varied considerably from medium-sized lowland eutrophic lakes (e.g. 279) to small, upland mesotrophic lakes (e.g. 088). There was one record from a flooded quarry (227). Pools were also occupied in cutover peat bogs, fens and heathlands throughout its range. Most sites were lowland, though with records as high as 345m in the Garron Plateau.

The literature states that *H. sahlbergi* is typical of base-rich sites with high amounts of organic matter. Wooded ponds, ditches and neglected ponds are habitats used in Britain (Southwood and Leston 1959). The limited evidence from NLS sites, and the records from acid pools and base-poor upland lakes indicate that *H. sahlbergi* is found here in a wider range of habitats. The trend that was found in eutrophic lakes in England, with *H. sahlbergi* occurring in the most eutrophic sites (Savage 1989), does not appear to hold in N. Ireland.

The published Irish records show a wide distribution (Halbert 1935; Leston 1958). In Europe the distribution includes most of the continent except the extreme north (Jansson 1986).

## *Hesperocorixa castanea*



Total number of sites 15 (6%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	12	0-99	10	Large lakes	0
0.25-0.99	2	100-199	1	Lakes	3
1-4.99	1	200-299	1	Reservoirs	0
5.0-9.99	0	300-399	2	Pools	12
10-249.99	0	400+	1	Rivers	0
250+	0	Max	410	Other	0

NILS sites Chemical  
One site type C

### *Hesperocorixa castanea*

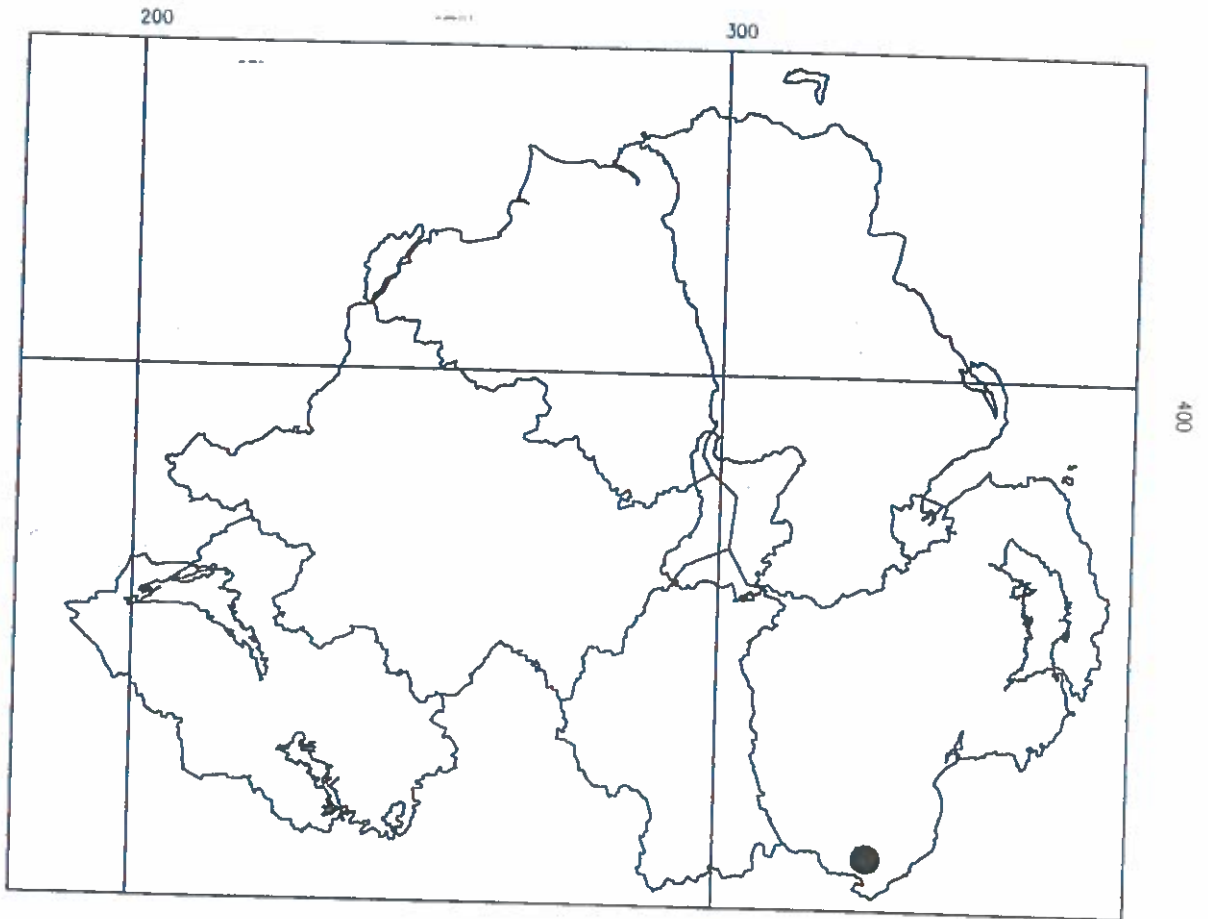
Predominately a pond species, *Hesperocorixa castanea*, was also recorded from small lakes. Two habitats are occupied, small upland acidic lakes and pools and disused peat-cuttings in lowland raised bogs. The lakes were all small, the largest having an area of 2 ha (071). All of the sites typically had margins dominated by *Sphagnum* mosses and peaty water. Records were scattered across N. Ireland, apart from most of Antrim, with an apparent concentration in the Mourne. The species was surprisingly not taken at the classic upland pool systems on the Garron and elsewhere in the Antrim uplands, which support other upland species. The bog records include Brackagh Bog (056) which has now very little acid bog remaining and where conditions must be marginal for the species.

The altitudinal records indicate a primarily lowland distribution due to the predominance of records from lowland raised bogs. The highest record was from Lough Aleim (003) at 410m. The only NILS site with *H. castanea* was a type C lake (071).

There were records from 11 vice-counties according to Leston (1958), including Antrim, Derry and Armagh in the north. Surprisingly in view of its habitat preferences there were no records from the raised bogs in midland counties. Kirby (1991) lists recent records from Kerry and Cork from bog pools.

In Britain *H. castanea* is commonest in the north and west and is uncommon above 1500' (Southwood and Leston 1959). The species is restricted to western and central Europe from southern Scandinavia to south-western Iberia (Jansson 1986).

## *Hesperocorixa moesta*



Total number of records 1 (0.5%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	-	0-99	1	Large lakes	0
0.25-0.99	-	100-199	0	Lakes	0
1-4.99	-	200-299	0	Reservoirs	0
5.0-9.99	-	300-399	0	Pools	0
10-249.99	-	400+	0	Rivers	0
250+	-	Max	75	Other	1 (QP)

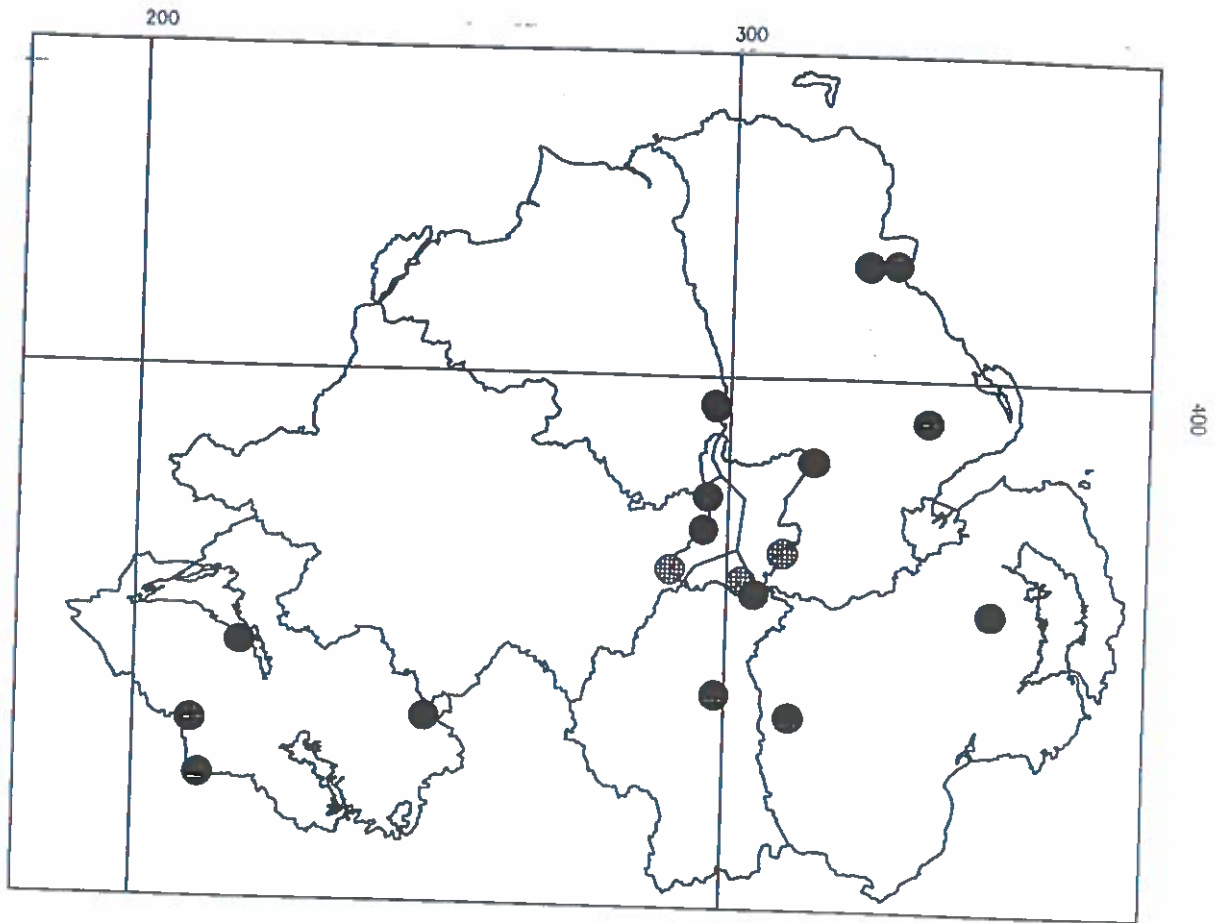
No information from NILES sites.

### *Hesperocorixa moesta*

This was the least frequently recorded species of corixid in the survey, with one record from a shallow pool in a sandpit at the southern edge of the Mourne, Co. Down (136). Whether the species occurs in natural habitats in the region is not known.

There appear to be few Irish records, though Leston (1958) records it from six counties. However this adds nothing to Halbert (1935). The records published in Halbert refer mostly to females and he considered these to be in doubt and probably referable to *H. castanea*. In Britain most of the records are from southern England (Jansson 1986). Southwood and Leston (1959) indicate a preference for pools especially temporary ones. This would tie in with the only site found for the species. Dolling (1991) states that *H. moesta* occurs in temporary, and especially woodland pools. *H. moesta* is confined to southern and central Europe and northernmost parts of Africa (Jansson 1986).

## *Arctocorisa germari*



Total number of records 15 (6%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	0	0-99	10	Large lakes	4 (7sites)
0.25-0.99	0	100-199	1	Lakes	7
1-4.99	6	200-299	2	Reservoirs	1
5.0-9.99	0	300-399	1	Pools	0
10-249.99	1	400+	1	Rivers	0
250+	7	Max	475	Other	0

NILS sites Chemical

A	-B	C	D	E	F	G	H	I	J
0	1	3	1	1	2	0	0	0	0



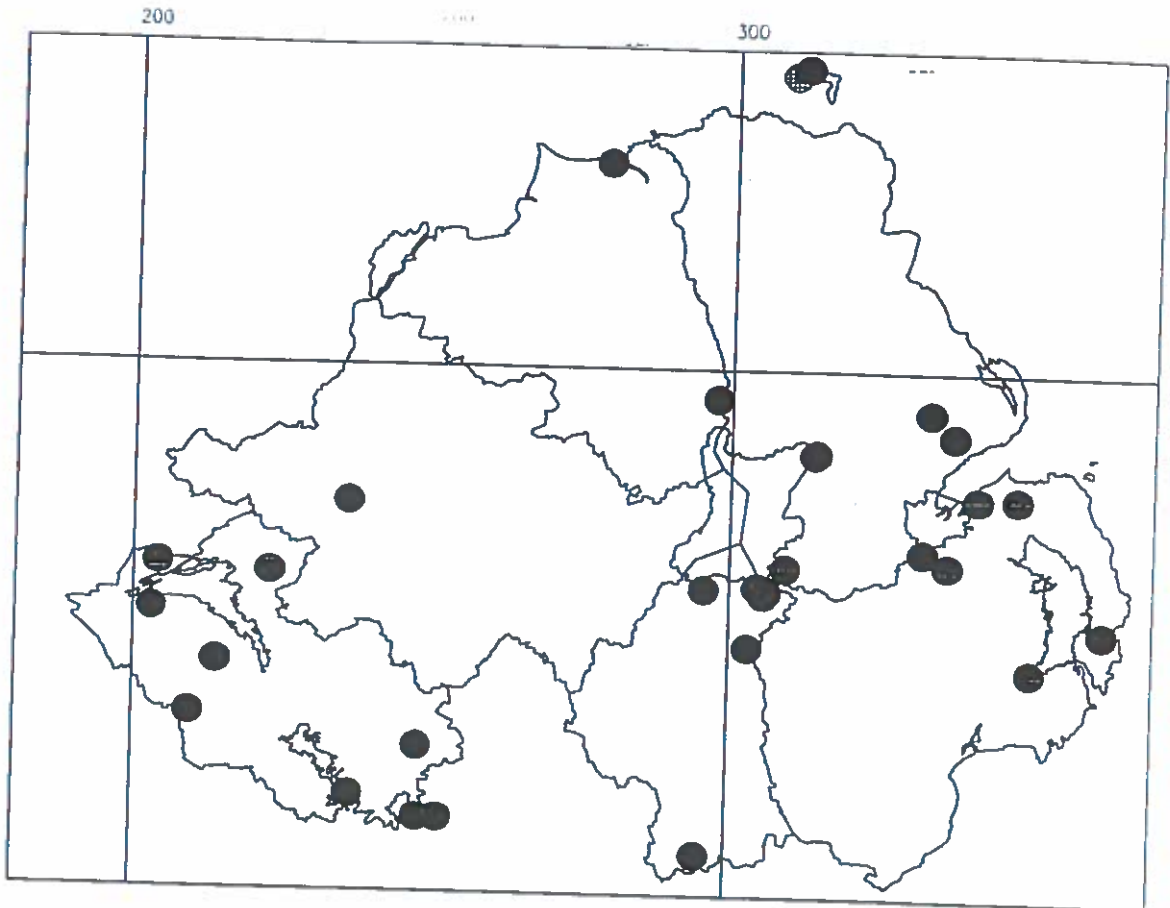
### *Arctocorisa germari*

*Arctocorisa germari* has one of the most interesting distributions as it encompasses lowland eutrophic lakes, many of the large loughs, and upland mesotrophic lakes. The map shows a concentration of records around Lough Neagh, where it is one of the commonest corixids. There were four records from the lake (051, 052, 064, 138). The three other mapped records are from Macan (1954), and further L. Neagh records are given in Wood and Smith (1993). The other large lakes with records are L. Beg (108), Lower L. Erne (237) and Lower L. Macnean (030).

There were records from three, lowland lakes in Armagh and Down. Two of these (153, 248) were classified as NILS type F, which is one of the highly eutrophic categories. The upland lake records were in Fermanagh (014, 267) and the Garron plateau of Antrim (094, 105). The only other record was from a reservoir in Antrim (266). The reasons for this distribution are unclear.

*Arctocorisa germari* is found in north and west of Europe from Ireland east to Poland and north to Finland, with a separate population in the Balkans (Jansson 1986). Halbert (1935) considered the species to be local in Ireland and mainly found in the north. Three records, all on Lough Neagh, are listed by Macan (1954) and included on the distribution map. A few vice-county records were added by Leston (1958), who reported it as absent from the south-east. In Kerry O'Connor *et al* (1986) found it in the lowland main lakes at Killarney and Kirby (1983) recorded it from small upland lakes in the same area. In Britain it occurs locally throughout lowland and upland areas. Its habitat preference is stated by Macan (1966) to include large calcareous lakes and upland pools, often with its upland relative *A. carinata* and *Glaenocorisa propinqua*. The former is absent from Ireland, but *G. propinqua* was recorded at several of the upland sites with this species in this survey, and also at one site in Kerry (Kirby 1983). At the sites on Lough Neagh and Lough Beg *A. germari* was frequently found in association with *Sigara fallenoidea* and *S. concinna*.

## *Sigara dorsalis*



Total number of records 28 (19%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	6	0-99	19	Large lakes	3 (3 sites)
0.25-0.99	2	100-199	8	Lakes	9
1-4.99	5	200-299	1	Reservoirs	5
5.0-9.99	1	300-399	0	Pools	6
10-249.99	1	400+	0	Rivers	0
250+	3	Max	245	Other	5 (C, D, QP, CL)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	1	2	2	2	2	0	1	0	3

### *Sigara dorsalis*

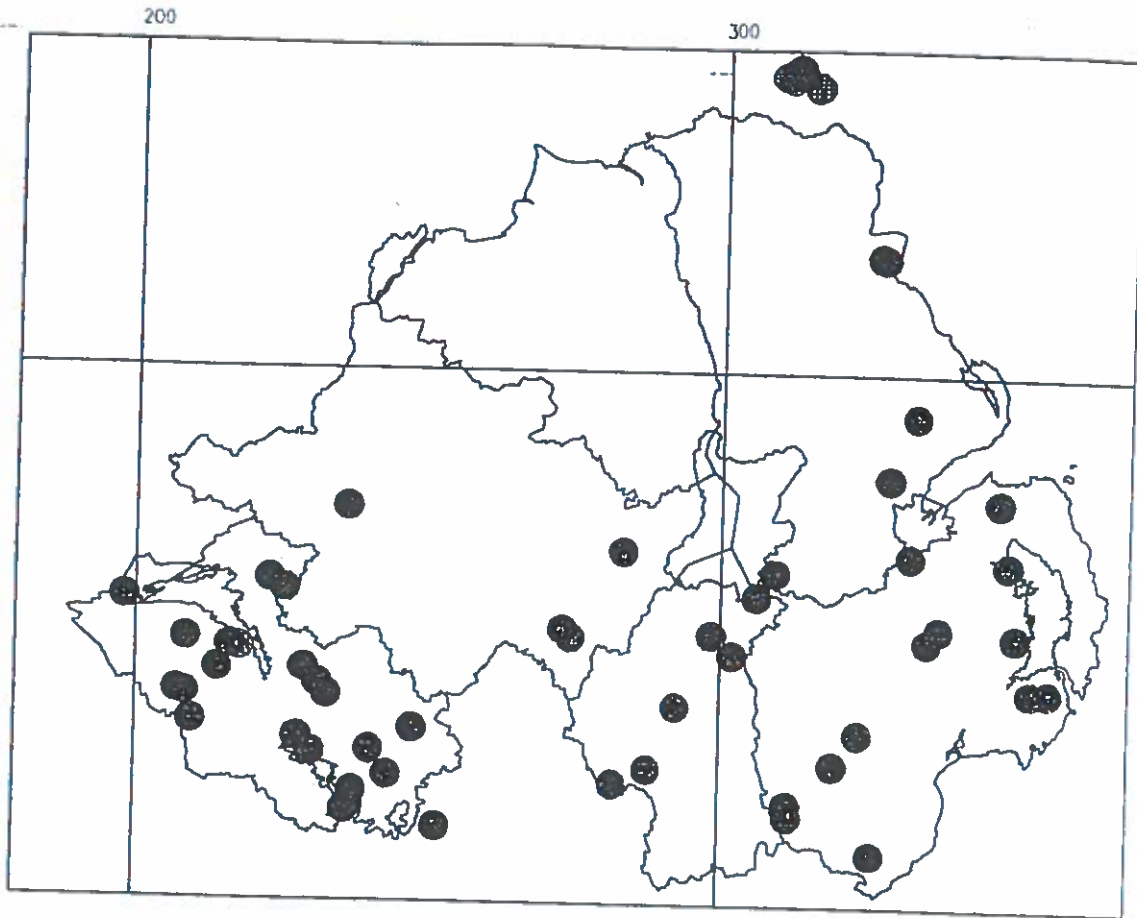
This and the following two species, *S. distincta* and *S. falleni*, are medium-sized corixids, which the literature state to be common lake species. *Sigara dorsalis* was the least frequently recorded of these three species. It was not as exclusively restricted to lakes as either *S. falleni* or *S. distincta*. Whilst 43% of the records of this species were from lakes of all sizes, this compared to 69% of the records of both the other species. The majority of the lakes were in the smaller categories (less than 5 hectares).

Studies in England indicate *S. dorsalis* occurring over a wide range of conductivities, except at high conductivity sites, where it is replaced by *S. falleni* (Savage 1981). This only applied to lakes of intermediate sizes (2-50 ha). The pattern revealed in this survey appears to support this, as the NLS data indicates a preference for the mesotrophic and least eutrophic categories.

*S. dorsalis* was recorded from all counties. The map however shows it to be largely absent from lowland Down. The absence from much of Down, and also the Upper Lough Erne basin, may be accounted for by the predominance here of type F and G lakes (Wolfe-Murphy *et al* 1992).

Halbert (1935) considered this species to be the commonest corixid in Ireland. The species has been recorded from 23 vice-counties (Leston 1958). However in his brief survey of Irish lakes it was taken less frequently than *S. distincta*. In the Killarney lakes *S. dorsalis* was found to be most common in the Lower lake, which is the most productive lake. In the oligotrophic Upper lake the species was largely absent (O'Connor *et al* 1986).

## *Sigara distincta*



Total number of sites 52 (23%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	10	0-99	34	Large lakes	3 (4 sites)
0.25-0.99	7	100-199	11	Lakes	32
1-4.99	10	200-299	6	Reservoirs	3
5.0-9.99	6	300-399	1	Pools	10
10-249.99	9	400+	0	Rivers	1
250+	4	Max	340	Other	2 (QP)

NILS sites Chemical

A	B	C	D	E	F	G	-H	I	J
0	3	3	3	1	1	4	0	10	8

## *Sigara distincta*

*Sigara distincta* was the second most frequently recorded corixid species in this survey. The abundance of the species in Ireland has been commented on by Macan (1954), who contrasted it with its absence from similar habitats in Denmark and in Britain.

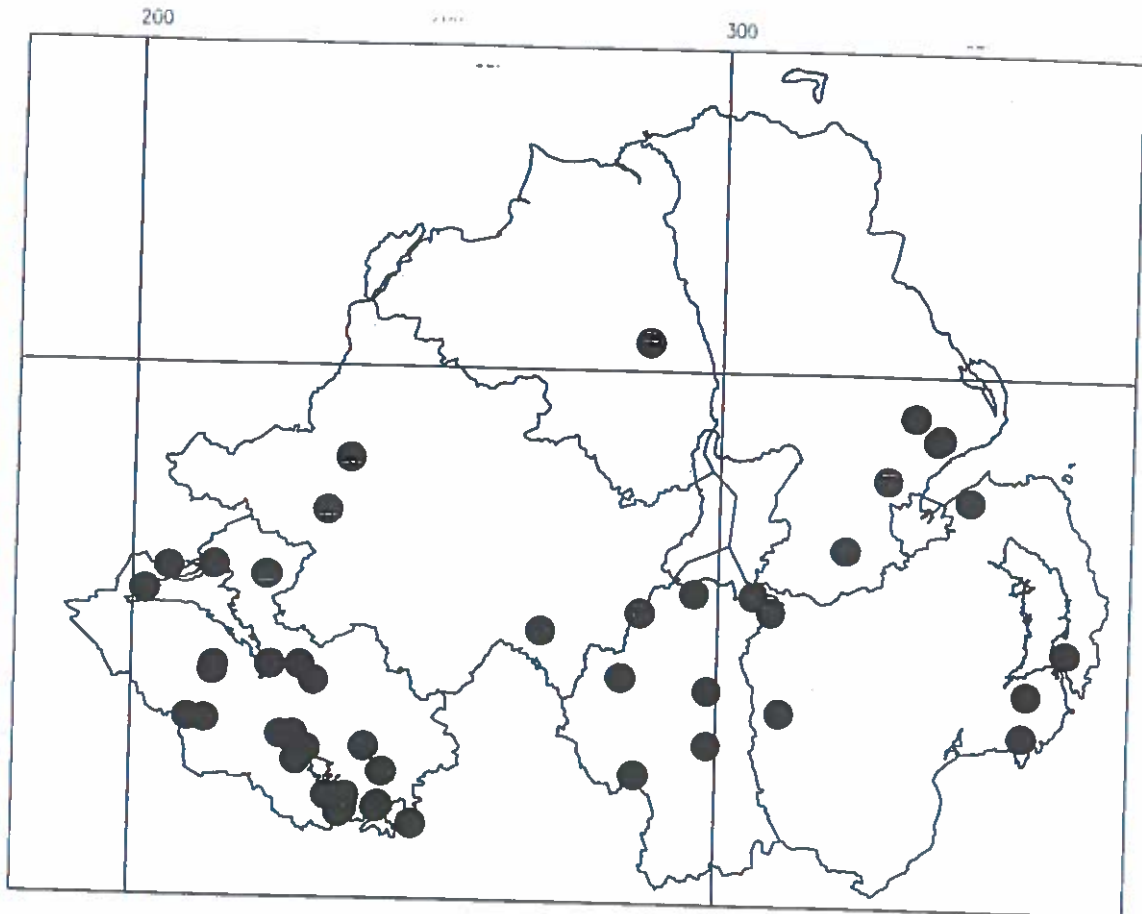
Records came from most areas of N. Ireland surveyed and from all habitats. It was recorded from Rathlin Island and in a few upland areas including the Garron plateau, where the highest record for the species (294) was located.

Small lakes were the main habitat type occupied. *S. distincta* was rarely recorded in large lakes, and the only records were from Lower and Upper Lough Erne. It was the most frequently recorded corixid in pool habitats. It was found in all the major lowland cutover bog and fen system in the east of the province and several of the Rathlin pools. Reservoir records were few and there was only one record from a river (247).

Halbert (1935) listed records from throughout Ireland from pools and lakes. The listing in Leston (1958) recorded the species from 23 vice-counties, the second-highest total. The species is clearly a common Irish species. Kirby (1983) only found it at one locality on Kerry. O'Connor *et al* (1986) however found it commonly throughout the Killarney lakes where it reached dominance in areas of nutrient enrichment.

Several studies have shown that the corixid fauna changes along a successional gradient with eutrophication (Savage 1989). *S. distincta* is found in low to medium conductivity sites within the range occupied by *S. dorsalis*, and between the oligotrophic species *S. scotti* and the eutrophic species *C. praeusta*. The NILS data do indicate that both *S. distincta* and *S. dorsalis* occur over a similar wide range of chemical types, but that *S. distincta* is most typically recorded from the slightly eutrophic and mesotrophic lakes. The preponderance of records in type I and J sites of this species is striking.

## *Sigara falleni*



Total number of sites 46 (20 %)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	1	0-99	35	Large lakes	3 (8 sites)
0.25-0.99	2	100-199	10	Lakes	24
1-4.99	6	200-299	1	Reservoirs	9
5.0-9.99	6	300-399	0	Pools	1
10-249.99	10	400+	0	Rivers	1
250+	8	Max	210	Other	3 (QP, D)

NILS sites Chemical

A	B	C	D	E	- F	G	H	I	J
1	0	1	4	4	3	6	5	4	2

### *Sigara falleni*

This is one of the main species of lake corixid. Including the reservoir records, almost 90% of the records of this species were from lakes. The only pond record was from a shallow, artificial peaty pond at Crom, Fermanagh (023). There was one river record from the R. Blackwater at the Argory, Armagh (118) and a record of R. Weyl's from a ditch on the Finn floods (240), Fermanagh. The only other non-lake records were from two deep pools in disused quarries (144, 226).

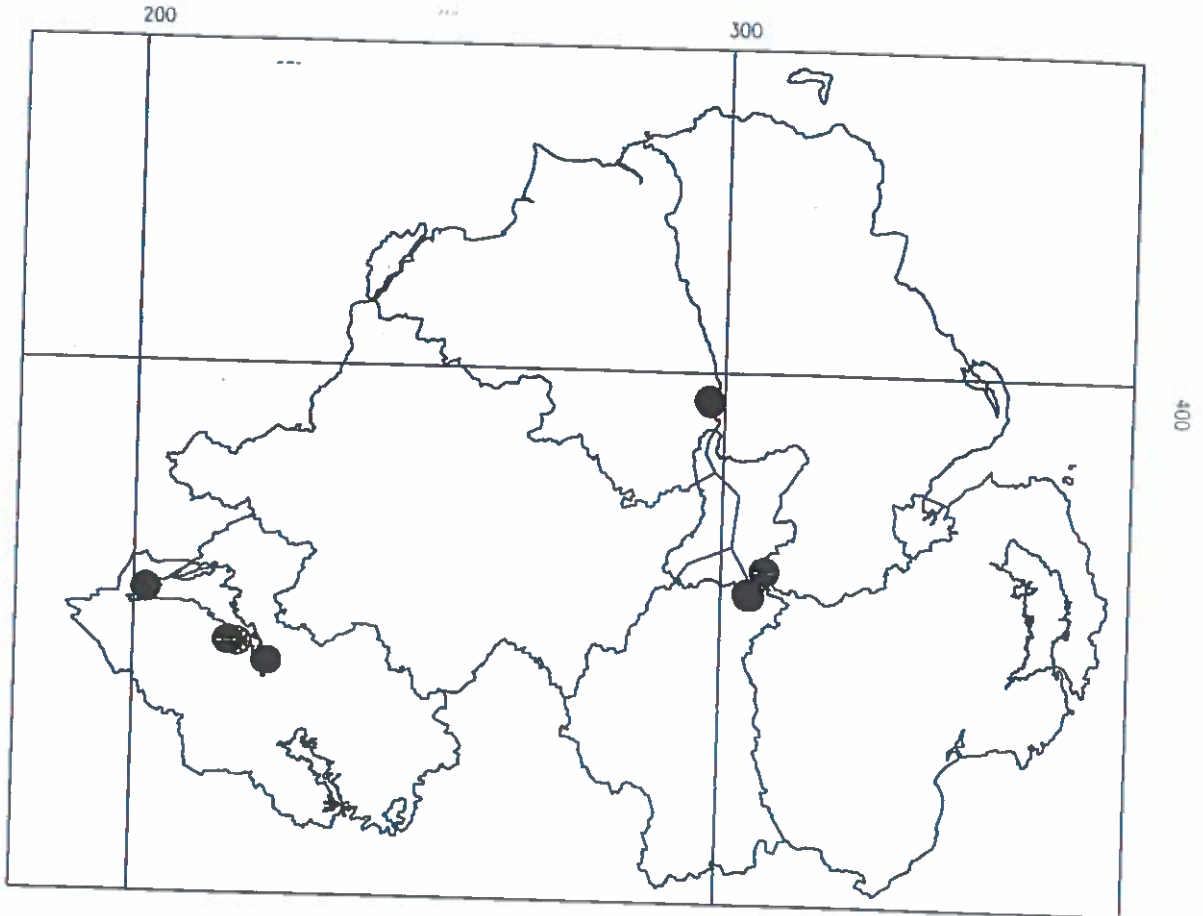
*S. falleni* was recorded from all of the major lakes surveyed in Fermanagh (Lower Lough Erne, Upper Lough Erne and Lower Lough Macnean), but was not found in the Lough Neagh system. Overall the species was relatively more common in Fermanagh than the other common lake *Sigara* species. Its absence from the lowland lakes in Down is puzzling in view of its apparent preference for eutrophic sites, which are common here.

*S. falleni* was the most frequently recorded aquatic Heteropteran in reservoirs. Records from these accounted for almost 20% of the total. The lake records include a larger proportion of middle-sized lakes than any other common species. 73% of the lake records came from sites over 5 ha in area. The species was also predominately a lowland species with only 1 record above 200m.

Data from NILS sites shows a clear bias towards the eutrophic lakes, especially groups F, G and H. Group E records are all reservoirs. It was rarely recorded from the base-poor categories, B and C. Studies in Britain indicate that *S. falleni* occupies the eutrophic end of the lake spectrum and tends to replace *S. dorsalis* at these sites (Savage 1989). The N. Irish data is in agreement with this pattern.

The European distribution covers most of central and northern Europe Jansson (1986). In Britain it is common except in upland areas and northern Scotland (Southwood and Leston 1959). The species is recorded from a wide range of non-acidic waterbodies, including rivers. Southwood and Leston (1959) state that though it flies readily it is a poor coloniser of new sites. This would appear not to be the case in N. Ireland in view of its frequency in reservoirs.

## *Sigara fallenoidea*



Total number of records 7 (3%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	0	0-99	7	Large lakes	3 (7 sites)
0.25-0.99	0	100-199	0	Lakes	0
1-4.99	0	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	0
10-249.99	0	400+	0	Rivers	0
250+	7	Max	45	Other	0

No information from NILS sites.



### *Sigara fallenoidea*

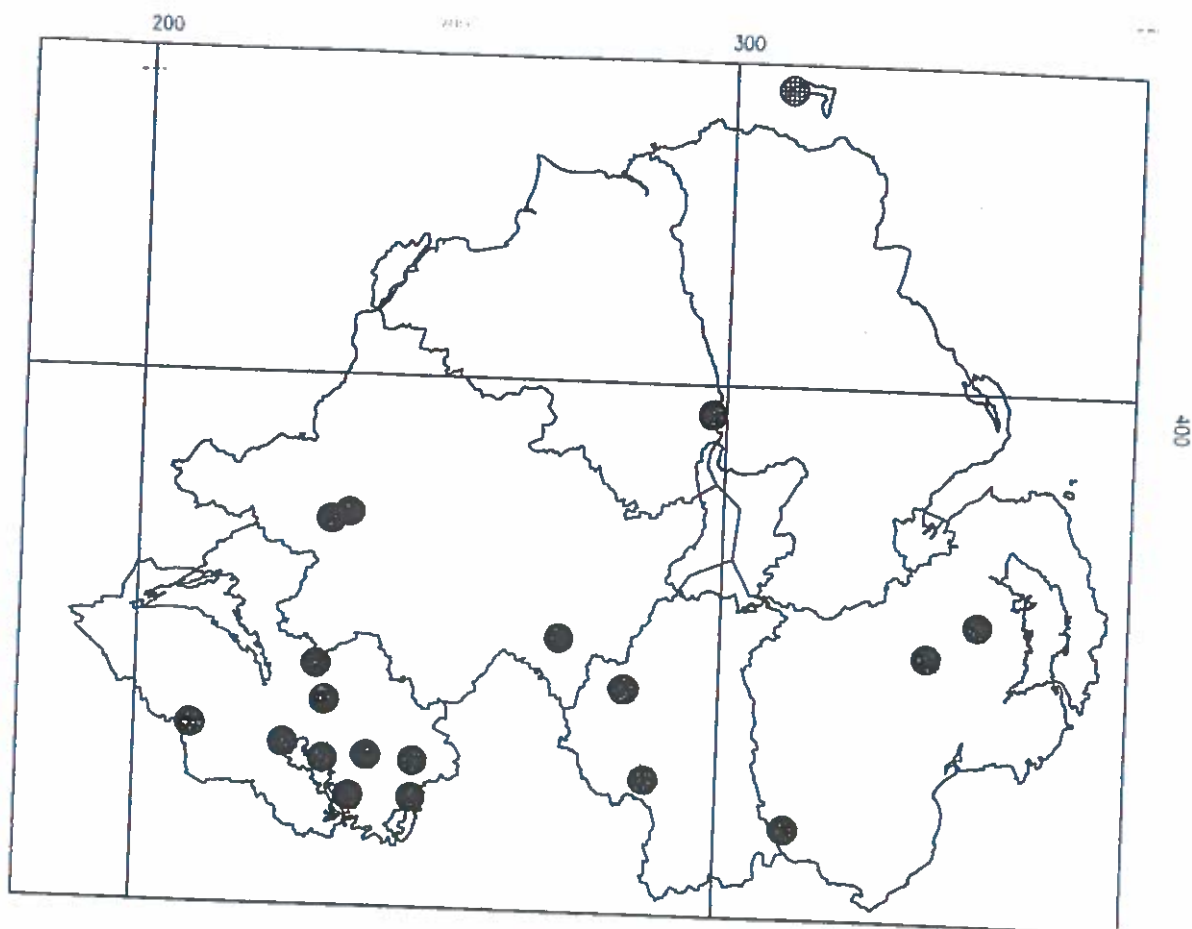
*Sigara fallenoidea* is the most interesting species of corixid found in Northern Ireland. Walton first recorded the species in 1936 and described it as a new species *Sigara pearcei* (Macan 1953). Subsequently it was found to be conspecific with a Canadian species, *Sigara fallenoidea*. As well as occurring in Ireland and Canada (where it is rare and found in the prairies), it has also been recorded from Finland and the Ukraine (Jansson 1986)

The Irish distribution is very distinctive. It is known from the Shannon lakes and also Lower Lough Erne (Macan 1954). It had not been recorded from Lough Neagh until found in this survey. However it was found to be abundant at two locations in the south-east of Lough Neagh (058, 084) as well as being present in Lough Beg. The species was also found at three sites on Lower Lough Erne (009, 195, 228). It was not found at any of the sites on Upper Lough Erne. *S. fallenoidea* was not found in the sample taken at one of the Lower Lough Erne sites (237) near where Macan recorded the species in 1951.

*S. fallenoidea* was found in Lower Lough Erne on rocky, open shores. On Lough Neagh the sites had sandy or stony open shores. It was found in large numbers at all sites.

The literature about this species states it is found in calcareous lakes (Southwood and Leston 1959), which would not hold true for Lough Neagh. It is however clearly capable of surviving in very eutrophic sites.

## *Sigara fossarum*



Total number of records 18 (9%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	0	0-99	15	Large lakes	3 (3 sites)
0.25-0.99	0	100-199	3	Lakes	14
1-4.99	9	200-299	1	Reservoirs	0
5.0-9.99	2	300-399	0	Pools	0
10-249.99	3	400+	0	Rivers	0
250+	3	Max	205	Other	1 (QP)

NLS sites Chemical

A	B	-C	D	E	F	G	H	I	J
0	1	4	2	0	0	0	1	4	2

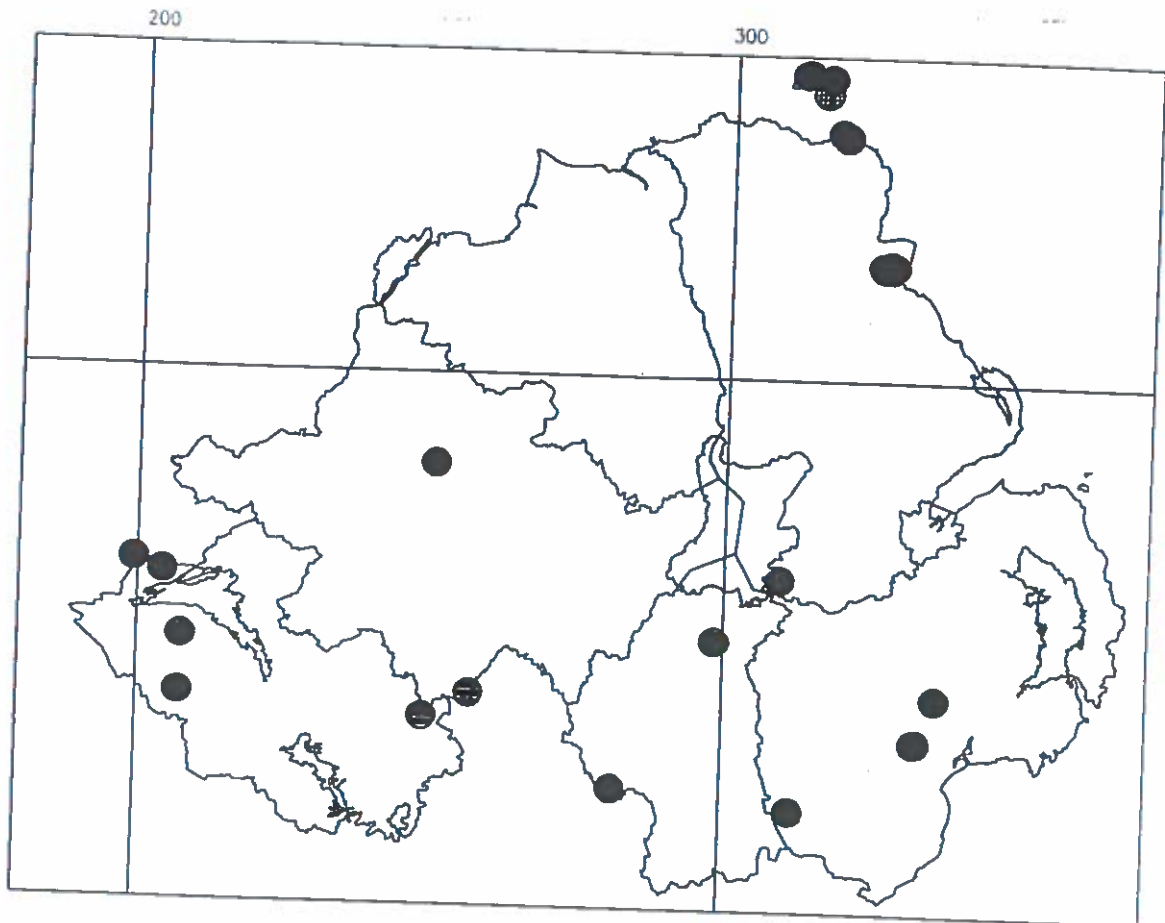
### *Sigara fossarum*

Apart from a single record from a flooded quarry (226), *Sigara fossarum* was only recorded from lakes. The distribution map shows a concentration of records in south-east Fermanagh, with scattered records in most other counties. The only Antrim record is one from Rathlin Island published in Flower (1982).

The lake sites were varied and the NLS data shows no clear pattern. The sites are split equally into the base-poor categories (B, C and D) and the mesotrophic/slightly eutrophic categories (H, I and J). Lowland lakes predominate in the records. Only 4 of the 17 sites were above 100m, with the highest record at 205m (178). The records of *S. fossarum* from the large lakes were from single sites on Upper Lough Erne (044), Lough Beg (108) and Lower Lough Macnean (030).

Both Halbert (1935) and Leston (1958) indicate this species is distributed throughout Ireland. It was not recorded in the recent Killarney studies, though found here in the past (O'Connor *et al* 1986; Kirby 1983). In Europe it is generally distributed through central and northern Europe (Jansson 1986). The distribution in Britain shows a mainly southern pattern. It is found in rivers and lakes here which have some organic matter and non-acidic conditions (Southwood and Leston 1959).

## *Sigara scotti*



Total number of records 23 (10%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	8	0-99	7	Large lakes	0 (0 sites)
0.25-0.99	5	100-199	6	Lakes	15
1-4.99	7	200-299	6	Reservoirs	0
5.0-9.99	3	300-399	4	Pools	8
10-249.99	0	400+	0	Rivers	0
250+	0	Max	345	Other	0

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	2	3	2	0	0	0	0	0	1

### *Sigara scotti*

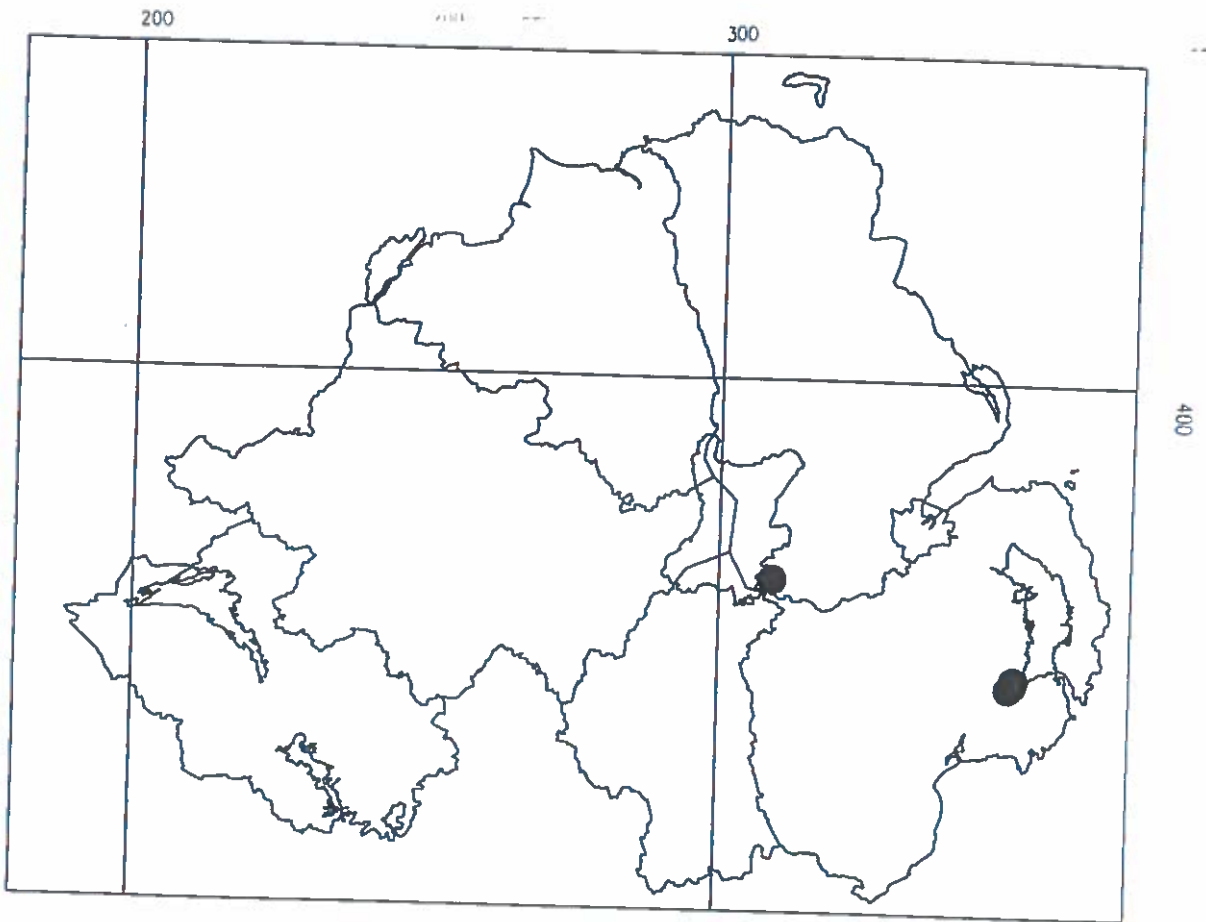
This corixid was found at scattered sites throughout N. Ireland, including Rathlin Island. *Sigara scotti* is found in two distinct habitats. In lowland areas it is typically found in deep, clear pools on cutover bogs. On Rathlin Island it was found in pools in heathland areas. In upland regions it inhabits base-poor lakes. However it is not a upland species in the sense of some others, as the altitudinal profile shows.

The NLS results show a clear preference for the base-poor lake types (B, C and D). This is one of the most clear-cut correlations shown by any of the species. Previous studies have shown that *S. scotti* is a species of oligotrophic waters. It shows a significant negative correlation with conductivity in Britain (Savage 1982). The survey data also shows that it is absent from large water bodies. Most of the sites were less than 5ha in area. This may be due to the presence of fish in the medium-sized and large lakes, as it is known that the predation on corixids by fish can reduce and alter the populations of the aquatic Heteroptera (Savage 1989).

Previous published Irish records of *S. scotti* show a similar ecological preference as found in this study. O'Connor *et al* (1986) found it to be the dominant corixid in the Killarney lakes except where eutrophication was apparent. Kirby (1983) recorded it widely in all types of standing water up to 2400 ft. Records in Halbert (1935) and Leston (1958) show a marked northern and western bias.

In Britain the distribution is strongly northern apart from isolated populations in southern England; it is the dominant corixid in parts of Scotland and upland England and Wales (Southwood and Leston 1959). *S. scotti* is confined to western Europe from central Spain to southern Norway (Jansson 1986).

## *Sigara lateralis*



Total number of records 3 (1%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	-	0-99	3	Large lakes	0 (0 sites)
0.25-0.99	-	100-199	0	Lakes	0
1-4.99	-	200-299	0	Reservoirs	0
5.0-9.99	-	300-399	0	Pools	0
10-249.99	-	400+	0	Rivers	0
250+	-	Max	15	Other	3 (CL, LT)

No information from NILS sites

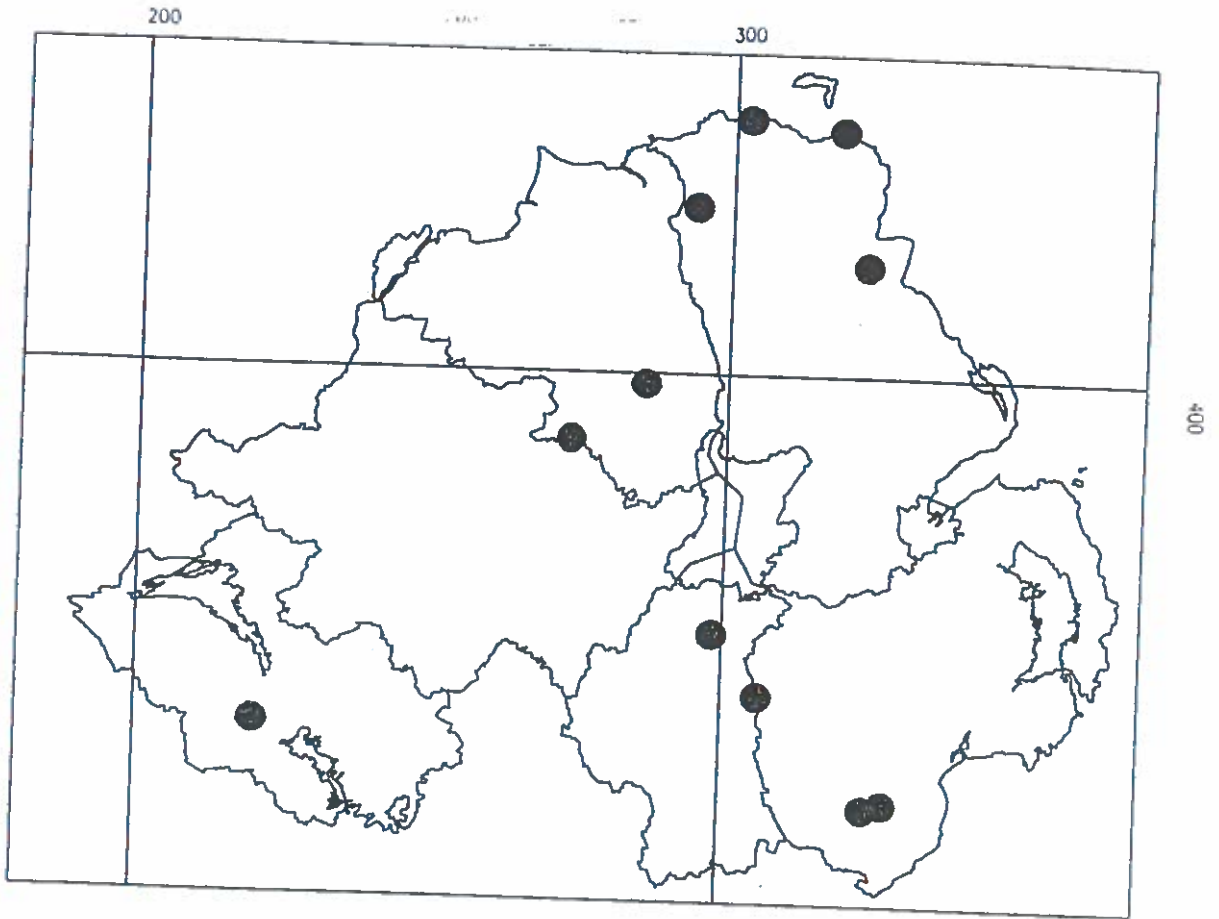
### *Sigara lateralis*

Like *Sigara stagnalis*, *S. lateralis* is a coastal-distributed species in Ireland. In Europe however it occurs widely away from the coast (Jansson 1986).

There were three records of this species, two from the Quoile Pondage, Down. Here it was abundant at the brackish end of the impoundment (079), and was the only species found here. It was taken with freshwater species upstream from this (078) but at much lower abundance. The only other record was of a few individuals caught in a moth trap on the Montiaghs Moss, Antrim (103). No records of this species has been made at this site, nor at Lough Neagh, so the origin of these individuals is unknown. *S. lateralis* was not recorded at any of the other brackish sites which had *S. stagnalis*.

The previous Irish records were mostly from southern and coastal sites. in Britain a coastal pattern is also apparent, but it also is found inland in grossly eutrophic ponds (Southwood and Leston 1959).

## *Sigara nigrolineata*



Total number of records 11 (5%).

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	8	0-99	5	Large lakes	0 (0 sites)
0.25-0.99	2	100-199	1	Lakes	2
1-4.99	0	200-299	2	Reservoirs	0
5.0-9.99	0	300-399	2	Pools	8
10-249.99	0	400+	0	Rivers	0
250+	0	Max	370	Other	1 (QP)

No records from NILS sites.



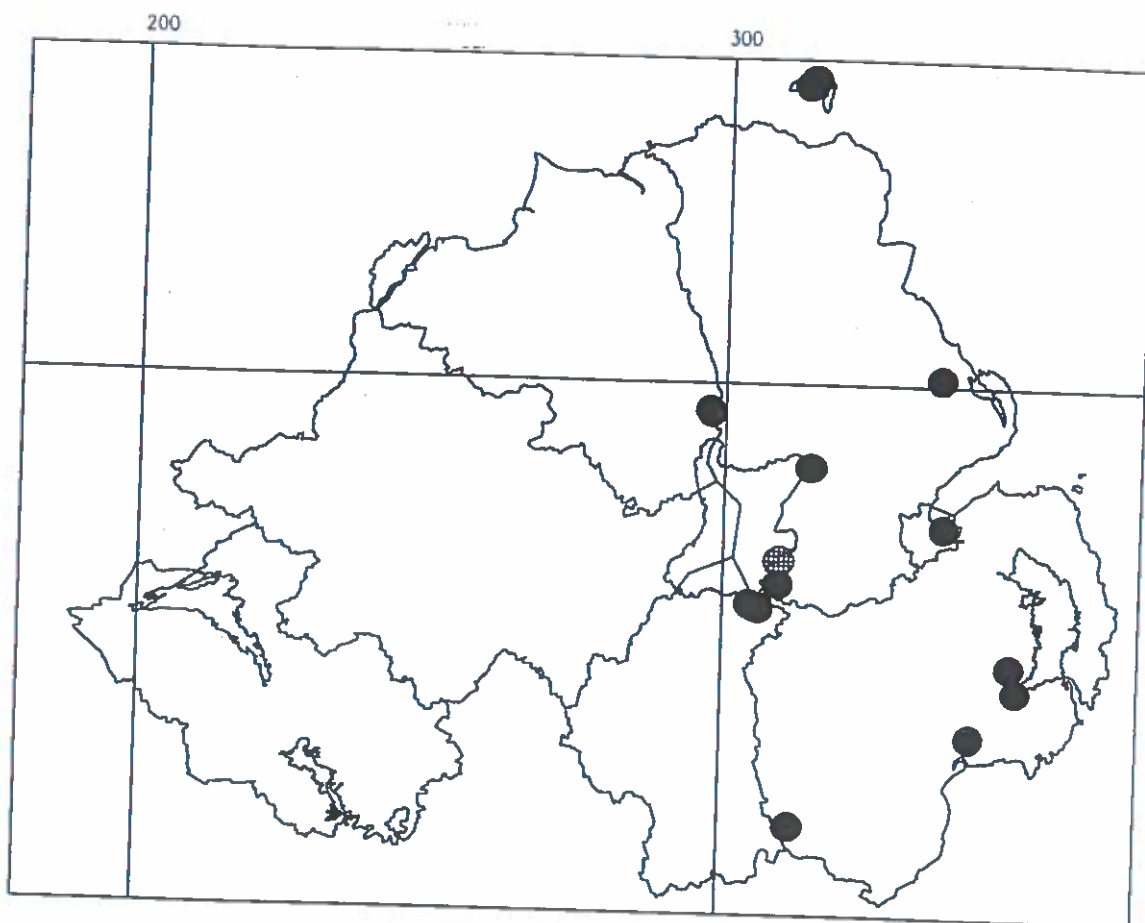
### *Sigara nigrolineata*

Adults of this species are amongst the smallest of the *Sigara* species, being only 5 to 6.5 mm in length. This is a common and widespread species throughout Europe, the extreme north of Africa and Turkey. In Britain it has a disjunct distribution related to its habitat preference (Jansson 1986; Southwood and Leston 1959). In the south-east of England *S. nigrolineata* is a lowland insect found in polluted ponds. In the west and north of Britain it is a species of base-poor pools and small lakes often with *Arctocorisa germari* and *Callicorixa wollastoni*.

Previous Irish records indicate a wide distribution. Halbert (1935) however did not add any comments to the species account in his list. The records in Halbert include sites in sand-dunes, lowland loughs and upland pools. It was also recorded from Clare Island. Leston (1958) added records from 5 vice-counties to Halbert's list. Kirby (1983) recorded it commonly in the Killarney area in high altitude ponds and loughs.

*S. nigrolineata* was recorded from ten sites. The distribution covers all six counties and at sites from sea-level on the north Antrim coast to 370m in the Mourne. At six sites the species was taken in very shallow peaty pools. These included both upland sites and cutover lowland raised bogs. This habitat type was not well-represented in this survey. The remaining sites include a pool in a quarry (220), a shallow pool in a sand-dune system (106) and two small loughs. One was a lough on the Garron plateau (095), the second, Scarva Lough (212), is a lowland eutrophic lake. In N. Ireland *S. nigrolineata* therefore occupies the full range of habitats it has been recorded in elsewhere in Ireland and Britain.

## *Sigara concinna*



Total number of records 12 (5%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	2	0-99	11	Large lakes	2 (4 sites)
0.25-0.99	1	100-199	1	Lakes	3
1-4.99	1	200-299	0	Reservoirs	0
5.0-9.99	0	300-399	0	Pools	2
10-249.99	1	400+	0	Rivers	0
250+	4	Max	135	Other	3(CL)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
1	0	0	0	0	1	0	0	0	1

### *Sigara concinna*

This species is one of the few which is confined to the eastern counties of N. Ireland. *Sigara concinna* was recorded from lakes and pools, including Lough Neagh (058, 064, 138) and Lough Beg (108), and also brackish sites on the east coast.

The Lough Neagh area appears to be the centre of its N. Irish distribution. Most of the Lough Neagh records were from the lake itself. It was recorded here by Halbert (1935) and again by Macan (1954). Both these records, like the survey records, were from sites on the eastern shore of the Lough. A single record came from Lough Beg where it was taken by R. Weyl. It was also found in an artificial lake at Kinnego on the south-east shore (063) and taken at a light trap set on a cutover bog (103).

Away from Lough Neagh and Beg, *S. concinna* was recorded on Rathlin Island and at scattered localities in counties Antrim and Down. The Down records include three brackish coastal sites (074, 078, 264). The Rathlin site is one of the Knockans pools (098) in the centre of the western arm of the Island.

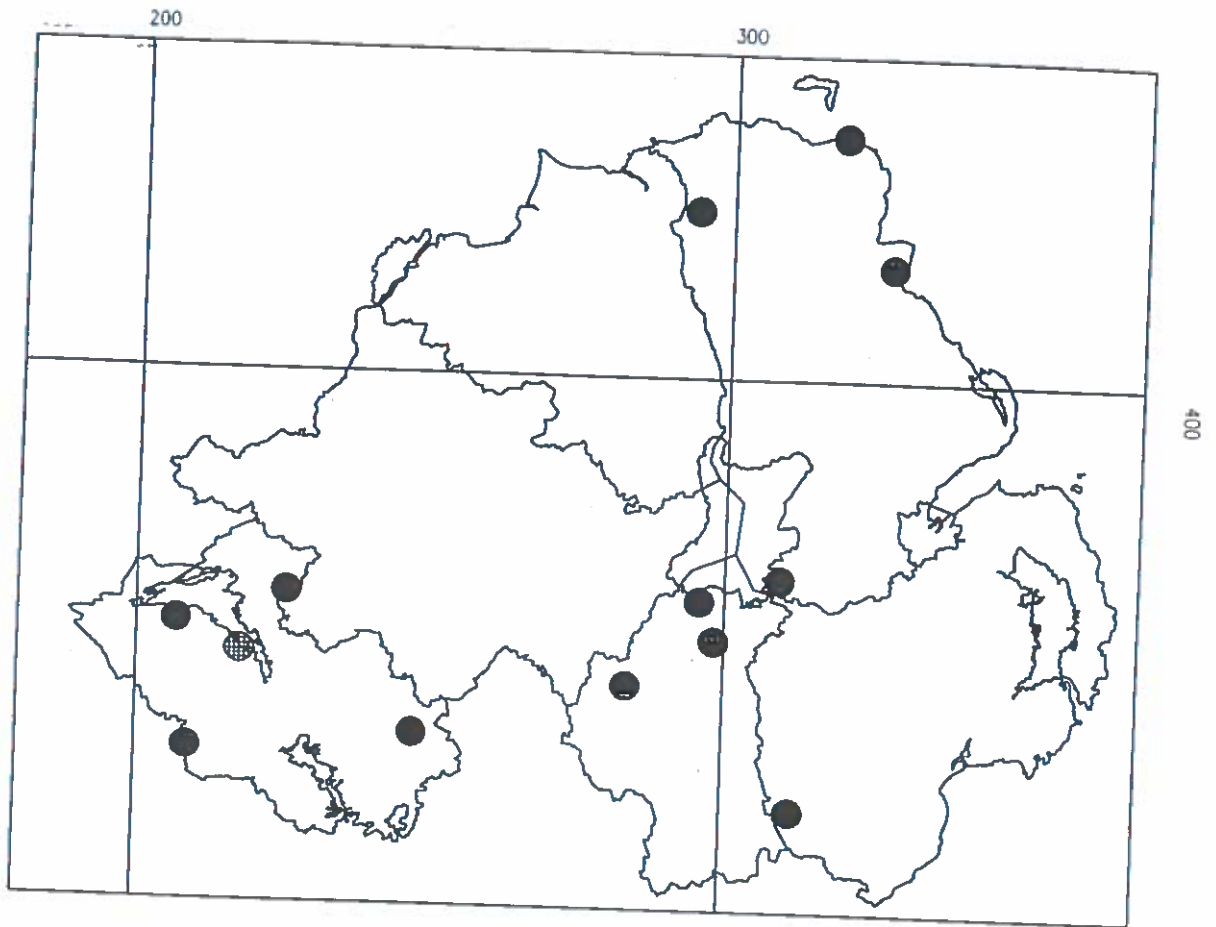
The sites were predominately lowland. The only sites above 30m are the Rathlin site and Kilwaughter (265). Only three sites were covered by NILS, so little can be learnt about its habitat preference from this. The records do suggest that the species can tolerate considerable eutrophication, as in Lough Neagh, as well as some degree of salinity as found in the coastal sites.

At the Lough Neagh sites *S. concinna* was found with *S. fallenoidea*, and *Arctocorisa germari*, whilst at the coastal sites it was present with *S. stagnalis* or *S. lateralis*.

Savage (1986) found that in the NW Midlands *S. concinna* was a lake species, though local and uncommon. It showed a positive correlation with conductivity. This appears to correlate with its N. Irish distribution.

Previous Irish records are few and well-scattered. Apart from Lough Neagh records previously mentioned, the only other N. Irish records were from Londonderry, where it was found by Buckle (Halbert 1935). In Europe the distribution is confined to central Europe. It is absent from most of southern and western Europe and most of Scandinavia (Jansson 1986).

## *Sigara semistriata*



Total number of records 12 (5%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	3	0-99	6	Large lakes	0 (0 sites)
0.25-0.99	2	100-199	4	Lakes	7
1-4.99	5	200-299	1	Reservoirs	0
5.0-9.99	0	300-399	1	Pools	3
10-249.99	0	400+	0	Rivers	0
250+	0	Max	305	Other	2 (QP)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
0	0	2	1	0	0	0	0	0	2

### *Sigara semistriata*

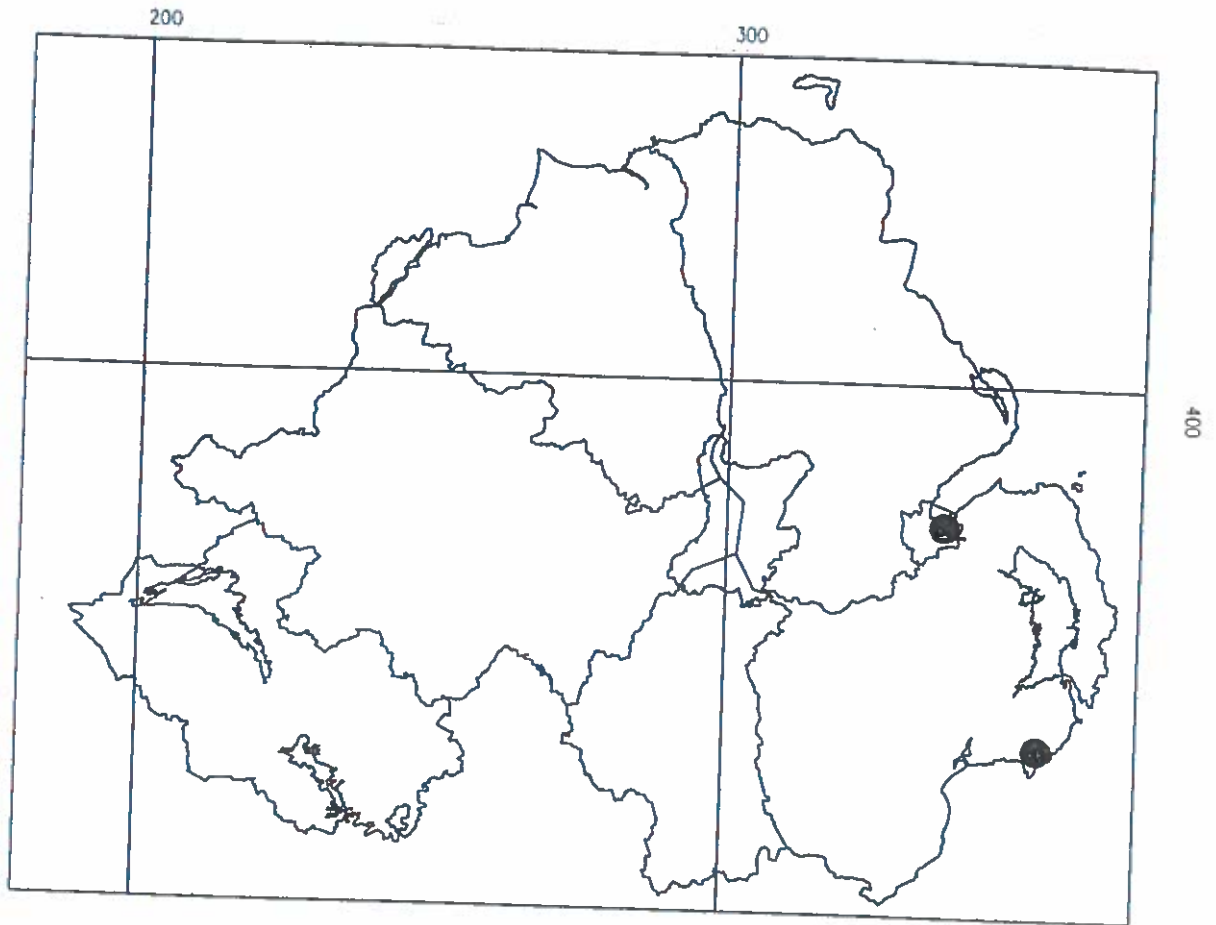
This small corixid was locally distributed in the province. There were records from 12 sites mostly in counties from Antrim, Armagh and Fermanagh. Small lakes and ponds were the most frequently occupied habitats. In addition there were two records from flooded quarries, both in Armagh (220, 226). The species clearly only occurs in small water-bodies with most sites under 2 ha in area. The largest site has an area of 3.75ha

The distribution data indicates a difference in habitat utilisation according to altitude. The pond sites were predominately lowland, peaty pools on cutover raised bogs (15-35 m). In contrast the lake sites were between 150 and 305 m. An additional site, Derrylard (060), was covered by NILS, but is in fact a flooded clay pit. These lakes were indicated by their NILS classifications to be either slightly eutrophic or base-poor upland types.

Elsewhere in Ireland the published records give no indication as to the species habitat preference. *S. semistriata* was not recorded in Killarney by either O'Connor et al (1986) or Kirby (1983, 1991). Halbert (1935) lists records from ten vice-counties throughout Ireland but without making any comment on its status. Additional vice-county records bringing the total up to 18 are shown in Leston (1958). The only additional record available is from Bunduff Lough, a shallow lake close to the sea in Sligo.

*S. semistriata* is principally a species of the north and west of Britain, where it is found in base-poor acid lakes which sometimes are polluted (Southwood & Leston 1959). Savage (1989) indicates it as being less common in Britain than in Ireland. The species is distributed through north and central Europe to central Asia (Jansson 1986).

## *Sigara stagnalis*



Total number of records 2 (1%)

Pond/lake area (ha)		Altitude (m)		Habitat types	
<0.25	-	0-99	2	Large lakes	0 (0 sites)
0.25-0.99	-	100-199	0	Lakes	0
1-4.99	-	200-299	0	Reservoirs	0
5.0-9.99	-	300-399	0	Pools	0
10-249.99	-	400+	0	Rivers	0
250+	-	Max	5	Other	2 (CL)

NILS sites Chemical

A	B	C	D	E	F	G	H	I	J
2	0	0	0	0	0	0	0	0	0

### *Sigara stagnalis*

The distribution of *Sigara stagnalis* is predominately coastal. In Europe it is found on the coast from Italy west and north to Sweden . It also occurs in North Africa and there is a separate population on the Black Sea coast (Jansson 1986). The Irish distribution as reported in the main publications indicates a southern distribution with most records south and west of Dublin and Galway (Halbert 1935; Leston 1958).

*S. stagnalis* is found in brackish water where it can tolerate quite high salinities (Southwood and Leston 1959). There were two records, both from NILS collections, from Strand Lough (080) and Victoria Park (264), both in Down. These sites are classified as chemical type A, which was the saline group. There are few sites of this type in N. Ireland and many of them are artificial (NILS 1992). The potential distribution of *S. stagnalis* is therefore limited to a few sites at all the major sea loughs and the species is dependant on the maintenance of these areas.

## HABITATS

The 237 sites with records have been categorised into 5 broad habitat types, small lakes, large lakes, ponds, reservoirs and rivers. A sixth category is included which covers artificial and miscellaneous sites. The categorisation of each site is given in Appendix 1.

The breakdown of the number of sites in each category is given in Table 1.

Habitat	No of sites	No of species
Small lakes	124	29
Large lakes	5 (25 sites)	22
Ponds	50	30
Reservoirs	13	7
Rivers	7	6
Others	18	18
Total	237	40

**Table 1:** Habitat summary table

### SMALL LAKES

For the purposes of this study small lakes were defined as areas of open water between 0.25 ha. and 250 ha. This is more restrictive than the definition in Smith *et al* (1991), which lists all areas of standing water shown on ordnance survey maps within N. Ireland, but wider than that used in the N. Ireland Lake Survey. This only covered lakes with areas between 1 and 250 hectares.

This survey has attempted to document the species distribution according to the chemical composition of the lakes as defined by NILS, and the lakes location and size. Tables 1 to 4 present these statistics.

124 sites were defined as being small lakes. This amounted to 52% of the surveyed sites. 29 of the 40 N. Irish species of aquatic Heteroptera were recorded from the lakes; these are listed in Appendix 4. No species was confined to this habitat group, but over 70% of the records of *Gerris argentatus*, *Sigara fossarum* and *Hydrometra stagnorum* were from small lakes. The most frequently recorded species in lakes were also the most



frequently species recorded overall. The effect of various factors on the species diversity within this habitat will now be examined.

### Effect of altitude

The fauna of the lowland lakes (those below 100m) is dominated by the common species of corixid, in particular *Sigara distincta*, *Callicorixa praeusta* and *Sigara falleni*. *Notonecta glauca* and *Nepa cinerea* are also very frequent species in these low altitude and mainly eutrophic lakes. There is little apparent variation across the province in the species occurrence at these sites.

With increasing altitude the number of species recorded shows a decline, which is particularly marked above 200m (see Table 2). However the most species-rich sites were the mid-altitude lakes between 100 and 200 m. The reasons for this are unknown, but it may be related to the diversity of lake types found at this altitudinal range.

Upland sites clearly support a much reduced fauna. However in many ways these are the most interesting sites as the species and the lake types are relatively rare. *Glaenocorisa propinqua* and *Callicorixa wollastoni* are the typical upland species, and virtually confined to sites above 200m. *Arctocorisa germari* is also an upland lake species, although it also occurs in lowland eutrophic lakes.

Altitude	0-99	100-199	200-299	300-399	400+
No. of sites	74	25	15	10	1
No of species	26	24	18	11	5
Mean no spp per site	2.8	3.9	2.6	2.4	-
Range	1-9	1-8	1-8	1-4	-

**Table 2:** Effect of altitude on species diversity in small lakes

### Lake area

The effect of lake area on the species occurrence is shown in Table 3. The smallest lakes are the most species rich on average but support less species than the 1-4.9ha category. Lakes above 5.0 ha show a much reduced

overall species diversity, though individual sites are not greatly poorer in species.

Area (ha)	0.25-0.99	1.0-4.99	5.0-9.99	10-249.99	250+
Number of sites	20	56	17	31	25
No. of species	26	29	17	17	21
Mean no. per site	3.6	2.9	3	2.7	-
Range of species no.	1-9	1-8	1-6	1-6	1-12

**Table 3:** Effect of lake area on species diversity

### Water Chemistry

Studies of the corixid faunas in lakes have shown correlations between the water chemistry and the distribution of individual species (see Savage 1989). Many of these have been referred to in the species accounts. The NILS data allows for an examination of this in N. Ireland. Table 4 shows the number of aquatic heteropteran species recorded in each chemical category. Whilst the number of sites in each was not even, there is an apparent trend showing increased species diversity in the mesotrophic lake types. The lowest species numbers are found in groups E, which are mostly reservoirs sites, group F lakes, which are the most highly enriched sites, and group A lakes which are the coastal sites. Whilst some of this may be related to the degree of coverage there is an indication of a real trend which is worthy of further investigation.

Category	A	B	C	D	E	F	G	H	I	J
No of sites	3	7	18	11	5	8	15	8	21	14
No of spp	4	15	23	16	6	9	13	12	16	19

**Table 4:** Number of species recorded in each NILS category.

### Individual sites

The richest individual lake site was a small artificial lake at Oxford Island, Co. Armagh (063). Nine species of aquatic Heteroptera were recorded

here. The reason for its richness are unclear, though its proximity to L. Neagh has probably helped colonisation of the site. Eight species have been recorded from three sites (002, 050, 148). These were all small mesotrophic or slightly eutrophic natural lakes. Apart from the presence of *Limnopus rufoscutellatus* (050) and *Notonecta obliqua* (002), all the species at these four sites were common.

## LARGE LAKES

The Northern Ireland Lake survey define large lakes as those over 250 ha. in area. There are seven lakes within this size class partly or wholly within N. Ireland. Samples were taken from five of these, from a total of 25 sites. No samples were taken from Lough Melvin, but there is a record of *Micronecta poweri* from this lake included in the database. In total 22 species were recorded from these lakes. The number of species recorded in each lake is shown in Table 5.

Lower Lough Erne had the longest species list. This is perhaps due to the diversity of shore types on the lake, which ranges from open, exposed and rocky shores to sheltered shores with reed swamp and fen. Lough Neagh has a similar range of shore type but supports two fewer species. The other lakes are smaller and slightly less diverse, though lack of sampling in Upper Lough Erne in particular may have affected the results.

The large lake community is dominated by corixids. *Callicorixa praeusta* and *Notonecta glauca* were the only species recorded from all five of the lakes. Three species, *Arctocorisa germari*, *Corixa punctata*, and *Hydrometra stagnorum*, were recorded from four of the lakes. The most frequently recorded species were *Callicorixa praeusta* (12 sites), *Sigara falleni* (8 sites), *Notonecta glauca* (8 sites), *Arctocorisa germari* (7 sites) and *Sigara fallenoidea* (7 sites). The latter was the only species restricted to the large lakes and not recorded in other habitats. Three of the four records of *Micronecta poweri* were from large lakes. *Arctocorisa germari* can also be considered as a large lake specialist though it also is found in other lakes. *Sigara fallenoidea* is undoubtedly the most interesting of the lake fauna, as it is unknown from the rest of western Europe.

	Neagh	Beg	Erne, Lwr.	Erne Upr	Macnean Lwr
<i>Cal pra</i>	■	■	■	■	■
<i>Not gla</i>	■	■	■	■	■
<i>Cor pun</i>	■	■	■	■	
<i>Arct ger</i>	■		■	■	■
<i>Hyd sta</i>	■		■	■	■
<i>Nepa cin</i>	■		■	■	■
<i>Cor den</i>	■	■	■		■
<i>Sig foidea</i>	■	■	■		
<i>Sig dor</i>	■	■			
<i>Velia cap</i>	■		■		■
<i>Sig dis</i>			■	■	■
<i>Sig falleni</i>			■	■	■
<i>Micronecta</i>			■	■	■
<i>Hesp lin</i>	■	■			■
<i>Sig con</i>	■	■			
<i>Microvelia</i>	■			■	
<i>Ger lac</i>		■	■		
<i>Sig fos</i>		■		■	
<i>Ger odo</i>			■	■	
<i>Ger tho</i>		■			
<i>Ger arg</i>			■		
<i>Cym bons</i>				■	
TOTAL NO	13	12	15	12	10

**Table 5:** Species recorded at large lakes

## PONDS

Burgis and Morris (1987) define a lake as any water-filled depression. Ponds they define as "something you could reasonably expect to wade across in a couple of minutes without getting completely wet". This habitat category includes all water-bodies less than 0.25 ha in area. Most of these open water habitats are pools on cutover bogs and fens and upland bog pool systems. A large proportion of the ponds are artificial in origin. In total 51 sites were defined as this habitat, which amounts to 20% of the sites surveyed.

Thirty species of aquatic Heteroptera were recorded from at least one pond site, making this the most species-rich habitat. The most frequently recorded species were *Notonecta glauca*, *Nepa cinerea* and *Sigara distincta*. However ponds do not constitute the main habitat for these species. This is the case for several species notably *Hesperocorixa castanea* (64% of records), *Sigara nigrolineata* (60%), *Gerris odontogaster* (41%) and

*Hesperocorixa sahlbergi* (41%). Of the rare species, *Corixa iberica*, *Gerris costai* and *G. lateralis* were solely recorded from ponds.

#### **Heathland pools on Rathlin Island and Fair Head, Co. Antrim**

There are numerous small pools and lakes on Rathlin in the areas of heath. Pools near the East Light, in Ballygill townland and in Knockans townland were sampled. 8 species of aquatic Heteroptera are recorded from these pools. The species present include both oligotrophic and mesotrophic species. A similar community is found on the adjacent mainland in pools which are found on the rocky depressions on Fair Head.

The most notable species present on Rathlin and Fair Head is *Corixa iberica*, which was found in four sites. This is only area in N. Ireland in which it is found as it is replaced elsewhere by *C. punctata*. The presence of *S. concinna* in the Rathlin pools is also of interest as it suggests that there is some saline influence on these. Other pool inhabitants include *N. obliqua*, which occurs in both areas, and *Gerris costai* and *Callicorixa wollastoni* on Fair Head, which suggest an affinity with the upland areas in N. Ireland.

#### **Cutover bogs and fens**

In the eastern counties of there are many relict areas of bog and fen with numerous pools. Sites vary from predominately acid to base-enriched, with individual pools also varying considerably. The pools are usually too small to support fish populations and therefore insects are free from the effects of their predation, and a rich community often develops. The species present will also be affected by the nature of the pools. One major factor is the water chemistry, which varies according to the depth of peat remaining on the site and the amount of ground-water influence. Sites can have pools in close proximity of very different character due to the extent of these factors. Other factors, including the age of the ponds, their depth and edge profile will probably also influence the insect communities, though the importance of these factors is unknown.

The importance of the cutover bogs for aquatic Coleoptera has been documented in Foster *et al* (1993). These sites also constitute some of the richest habitats for aquatic Heteroptera. Important sites include Montiaghs Moss (103, mixed) , Brackagh Moss (056, mostly fen), Selshion Moss (068, acid), Lackan Bog (073, acid) and Derryleckagh Bog (173, mixed). The Montiaghs Moss alone has a species list of 15 species, by far the largest single list from any N. Irish site. This lowland cutover bog is particularly notable for the presence of *Glaenocorisa propinqua*, otherwise an upland

species in N. Ireland, and the gerrid *Limnoporos rufoscutellatus* which is only recorded from a handful of Irish sites.

The cutover bog pool complexes supported a varied fauna of upland and base-poor aquatic Heteroptera as well as species typical of more eutrophic sites. *Notonecta obliqua* was found on acidic bog sites in the north and west. *Sigara nigrolineata* was typically found in very shallow peaty pools and runnels in bogs and heaths. *Hesperocorixa castanea* sometimes was found in these shallow runnels, but was more common in acid *Sphagnum*-dominated pools. *Cymatia bonsdorffii* was also recorded from many of the major sites, though it was less restricted to pools than many of the other species.

### Upland pools

The upland pools on the Garron plateau in Antrim and in the west Fermanagh uplands are almost certainly natural systems within blanket bogs. In the Mourne Mountains in Down pools can be found on the summits of mountains and in rocky depressions. These are characteristically ombrotrophic and base-poor. *Callicorixa wollastoni* is the typical species of these pools found in all the above areas. *Glaenocorisa propinqua* has a more restricted distribution, and was found in the Garron pools and also in nearby lakes. *Gerris costai* is the other upland pool specialist recorded from the Mournes and the Sperrins. Under-recording may account for its absence in the other uplands.

### OTHER SITES

This category contains a miscellaneous range of eighteen sites that could not be categorised into the lake/pond division. The sites included habitats, which though not the main focus of the study, were sampled so that the entire range of open water habitats known to be utilised by aquatic Heteroptera was at least partially covered. It includes ditches in agricultural land (3 sites), canals (2 sites), flooded quarries and sand workings (6 sites) and brackish coastal sites (7 sites). Most of the sites are artificial in origin or highly altered natural habitats. The presence of species will depend on many factors, but the ability of individual species to colonise the site will be of major importance in determining the fauna.

The five sites classified as ditches and canals supported seven common species. A greater range of species was recorded at the other sites.

### Coastal sites

Most of the coastal sites covered are included in the inventory of lakes produced by Smith *et al* (1991) and some were covered by NILS. These were classified as category A in the chemical classification which only contains brackish water sites. The sites in this category are probably all artificially created, usually through the impoundment of the upper tidal reaches of estuaries. Examples include Strand Lough (080), Victoria Park Lake (264) and the Quoile Pondage (078, 079). The fauna of these sites will be determined by the salinity of the water and also the degree of naturalness of the site.

Two species, *Sigara stagnalis* and *S. lateralis* were only found in these brackish sites, though the latter was also taken in moth trap near Lough Neagh. Both these species are known to be common in brackish waters elsewhere, with *S. stagnalis* the most tolerant of high salinities. One of only two records of *Corixa panzeri* was from a brackish pond at the Bann Estuary (211A).

### Flooded quarries

Disused quarries often flood creating deep, barren open water pools. One flooded quarry in Londonderry was considered to be the one of the few truly oligotrophic lakes in N. Ireland (Gibson *et al* 1992). The quarries are probably mostly flooded from ground-water sources so their chemical status is linked to the geology. However no data was available on the quarries surveyed to investigate the species present with the trophic status of the water. Other factors which are probably of importance in determining the composition of their fauna will include the age of the quarry (specifically the abandonment of the quarry), the distance from other waters, and the landuse of the quarry.

Five quarries and one sand-working were surveyed. Three of the quarries were disused and partially flooded (155, 226, 227) with deep pools. The quarry at Carrickreagh (236) had only shallow, temporary pools, though it is long disused, and Selshion quarry (220) had one large shallow pool which is regularly pumped out to control its level. The sand-workings at Tullyframe (136) had shallow pools. The fauna of these quarries was varied. Most species were found at just one site. The species found in the deep pools were typical lake *Sigara* species, while the shallower ponds supported *Gerris* species, including *G. thoracicus*, and most notably at one site, *Hesperocorixa moesta*. This was the only record of this species.

## RIVERS

Only seven riverine sites were sampled as they were outside the remit of this survey. The few sites ranged from small streams (e.g. 127), to fast flowing rivers (e.g. 282) and sluggish lowland rivers (e.g. 2118). Together they only supported six species. The single record of the pondskater, *Aquarius najas*, was the most significant.

## ADDITIONAL SPECIES

40 species of aquatic heteropteran were recorded during this survey. The Irish fauna contains an additional nine species whose status is summarised below.

### *Velia saulii*

Records of this water cricket are published in Kirby (1983 and 1991). It is a northern species but apparently confined to oligotrophic lakes in Kerry.

### *Microvelia pygmaea*

Records of this species are published in Walton (1981). It is a southern species only recorded from Cork in a few short-lived colonies.

### *Aphelocheirus aestivalis*.

Bracken (1974) summarises the Irish distribution. It is found in rivers and occasionally large lakes. There are old records from Lough Neagh and it also occurs in the Erne system.

### *Notonecta maculata*

There is one record of this species from Cavan published in Macan (1954).



*Notonecta marmorea*

This is a southern species which has been recorded in coastal pools along the south coast from Waterford to Kerry. (Halbert 1935; Leston 1958)

*Plea leachi*

Records from the north are published in Halbert (1935). It is common in Britain in weedy ponds, lakes and streams.

*Corixa affinis*

This has a similar distribution to *Corixa panzeri*. There are old records from the north published in Halbert (1935), but no recent records.

*Sigara selecta*

This is known from just a few saltmarsh pools in Kerry. It has a southern distribution in Britain. In view of this and the rarity of its habitat in the north, it is unlikely to be found here.

*Sigara venusta*

This has been recorded from Armagh, Down and Londonderry (Halbert 1935). There have been no records since then. It is a northern species of acid pools and lakes, so its absence from the region is puzzling.

## CONCLUSIONS

This study has been the first comprehensive review of this group in N. Ireland. It has set a baseline account of the distribution of the group. Further studies will be able to build on this.

One of the main aims of the study was to investigate the fauna of the small lakes in N. Ireland. The results show that as far as this group is concerned the lakes support a rather uniform fauna throughout the lowlands. The most interesting species occur in upland lakes. A more varied and frequently richer fauna is found on cutover bogs and fens. The species diversity of some of these sites is very high and further confirms what is known from studies of other insect group of the importance of these sites. As with other groups the Montiaghs Moss, Antrim stands out as a site of exceptional value.

Several species recorded in N. Ireland can be considered rare and the populations here represent an important segment of the British and Irish populations. The status of others is still unclear and further work is required to investigate them. Appendix 5 summarises the status of each species in N. Ireland. It is also desirable that the study of this group (and the aquatic Coleoptera) is extended to include the N. Irish rivers. This habitat has seen many changes through large scale drainage work, yet the fauna is still largely undocumented.

The conservation needs of the aquatic Heteroptera largely depend on the maintenance of water quality in sites. The species which are most likely to suffer declines are those of oligotrophic and acidic sites which face the threats of cultural eutrophication and habitat loss. Another threat is the introduction of fish. This is known to have a significant negative impact on the populations of corixids in particular (Savage 1989). Whilst many lakes already have fish populations, the artificial stocking of lakes could threaten some populations.

## **SUMMARY**

1. Records collected from 237 sites throughout Northern Ireland
2. 40 species of Aquatic Heteroptera were recorded, several for the first time for many years.
3. Pools on cutover bogs and fens supported the richest and most varied fauna.
4. Important sites for aquatic Heteroptera were identified, including Montiaghs Moss, Antrim; the lakes and ponds on Garron Plateau; the Rathlin Island ponds; and the large lakes Lower Lough Erne, Lough Neagh and Lough Beg.
5. Small lakes, while in total supporting a large number of species, were individually found to be poor in species.
6. There appears to be some correlation between the NLS water chemistry category and the species diversity of the lakes.

## REFERENCES

- BURGIS, M.J. and P. MORRIS. (1987) **The Natural History of Lakes.** Cambridge University Press, Cambridge.
- DOLLING, W.D. (1991) **The Hemiptera.** Oxford University Press
- FLOWER, R.J. (1982) A comparative limnological survey of Rathlin Island, County Antrim, with particular reference to Diatoms. **Proc. R. Ir. Acad. (B)** 82: 1-20.
- FOSTER, G.N, B.H. NELSON, D.T. BILTON, D.A. LOTT, R. MERRITT, R.S. WEYL and M.D. EYRE. (1992). A classification and evaluation of Irish water beetle assemblages. **Aquatic Conservation: Marine and Freshwater Ecosystems** 2:185-208.
- GIBSON, C.E., S.J. SMITH and S. WOLFE-MURPHY. (1992) Contributions to the regional limnology of Northern Ireland (6) The lakes of Co. Londonderry. **Ir. Nat J.** 24: 122-126
- HALBERT, J.N. (1935) A list of the Irish Hemiptera (Heteroptera and Cicadina). **Proc. R. Ir. Acad. (B)** 42: 211-318
- JANSSON, A. (1986) The Corixidae (Heteroptera) of Europe and some adjacent regions. **Acta Entomol. Fennica** 47: 1-94.
- KIRBY, P. (1983) Heteroptera recorded from the Killarney area 28 Aug. - 7 Sept. 1981. **Ir. Nat. J.** 21: 45-47.
- KIRBY, P. (1991) Hemiptera (Heteroptera and Auchenorrhyncha) recorded from south-west Ireland (Cos. Cork, Kerry and Clare), September 1989. **Bull. Ir. biogeog. Soc.** 14: 90-104.
- KIRBY, P. (1992) **A review of the scarce and threatened Hemiptera of Great Britain.** UK Nature Series No.2. JNCC, Peterborough
- LESTON, D. (1958) The distribution of waterbugs (Hemiptera-Heteroptera: Hydrocorisae) in Ireland. **Entomologist's Mon. Mag.** 94: 26-31
- MACAN, T.T. (1954) Records from some Irish lakes. Part 1- Mollusca, *Gammarus*, *Asellus*, Ephemeroptera and Heteroptera. **Proc R. Ir. Acad. (B)** 56: 135-157.
- MACAN, T.T. (1965) A revised key to the British water bugs (Hemiptera-Heteroptera) with notes on their ecology. **Scientific Publications of the Freshwater Biological Association No. 16.**
- O'CONNOR, J.P. (1986) Notes on *Scolopstethus puberulus* Horvath and *Limnoporus rufoscutellatus* (Latreille)(Hemiptera) in Ireland. **Entomologist's Record** 98: 33-35.

- O'CONNOR, J.P., M.F. O'GRADY and J.J. BRACKEN. (1986) Observations on the Corixidae (Insecta: Hemiptera) of the Killarney Lakes and District. **Bull. Ir. biogeog. Soc.** 9: 15-26.
- SAVAGE, A.A. (1982) Use of water boatmen (Corixidae) in the classification of lakes. **Biological Conservation** 23: 55-70.
- SAVAGE A.A. (1989) Adults of the British Aquatic Hemiptera Heteroptera. **Scientific Publication of the Freshwater Biological Association No. 50.**
- SMITH, S.J., S.A. WOLFE-MURPHY, I. ENLANDER and C.E. GIBSON. (1991) **The Lakes of Northern Ireland; an annotated inventory.** HMSO, Belfast
- SOUTHWOOD, T.R.E. and LESTON, D. (1959) **Land and Water Bugs of the British Isles.** Warne, London.
- WOLFE-MURPHY, S.A., E.W. LAWRIE, S.J. SMITH and C.E. GIBSON. (1992) **The Northern Ireland Lake Survey: A report to the Department of Environment for Northern Ireland.** 8 vols.

Appendix 1 Survey sites listed by site number with county, grid reference, altitude, habitat type and NILS category. The area is expressed in size-classes which are shown at the end.

Site	Name	County	Grid Ref	Altitude	Area	Type	NILS type
001	Lough Acrussel	F.	H259411	45	5	L	E
002	Lough Alaban	F.	H069438	245	3	L	B
003	Lough Aleim	F.	H151321	410	1	P	
004	Ballintempo	F.	H084434	245	1	P	
005	Ballydoolagh Lough	F.	H284479	135	5	L	D
006	Lough Barry	F.	H272360	45	5	L	G
007	Black Lough	F.	H484407	250	2	L	
008	Braade	F.	H044548	210	1	P	
009	Camagh Bay, L.L.Erne	F.	H160517	45	6	LL	
010	Lough Coole	F.	H255435	50	5	L	H
011	Corlatt, Upper L. Erne	F.	H356236	45	6	LL	
012	Cornagogue Lough	F.	H474304	85	3	L	I
013	Corraharra Lough	F.	H356228	45	2	L	
014	Lough Cushkeery	F.	H487339	265	3	L	B
015	Cuilcagh pool system	F.	H140297	395	1	P	
016	Derrymacrow Lough	F.	H365254	45	5	L	I
017	Lough Eyes	F.	H323483	80	5	L	I
018	Five Points Bog	F.	H199380	57	1	P	
019	Friar's Lough	F.	H368268	45	5	L	I
020	Glencreawan Lough	F.	H033566	245	5	L	D
021	Gortgranagh	F.	H350293	45	1	P	
022	Gortmacconnell	F.	H136304	365	1	P	
023	"Green Bottoms" Crom	F.	H363247	45	1	P	
024	Inisherck, Upper L. Erne	F.	H358244	45	6	LL	
025	Inishfendra, Upp. L. Erne	F.	H3723	45	6	LL	
026	Kilmacbrack Lough	F.	H427296	65	4	L	G
027	Knockninny, Upp. L. Erne	F.	H280314	45	6	LL	
028	Largalinny Lough	F.	H070537	85	2	L	
029	Letter (Shean) Lough	F.	H068565	305	2	L	
030	Lower Lough Macnean	F.	H095386	55	6	LL	
031	Lower Lough Macnean	F.	H124384	55	6	LL	
032	Meenloughabank	F.	H053497	235	1	P	
033	Mill Lough	F.	H244384	50	5	L	I
034	Monawilkin Lough	F.	H082539	135	4	L	J
035	Moorlough	F.	H386304	60	5	L	G
036	Lough Mulshane	F.	H320509	175	3	L	B
037	Lough Nabrickboy	F.	H035503	205	3	L	C/D
038	Lough Nabull	F.	H470376	195	3	L	
039	Lough Nalughoge	F.	H365243	45	4	L	J
040	Lough Napeasta	F.	H395366	115	3	L	C
041	Lough Narye	F.	H396339	120	4	L	D
042	Polasumera River	F.	H145311	300	na	R	
043	Rossdill Lough ditch	F.	H360255	45	na	D	
044	Rossdoney Quay	F.	H253358	45	6	LL	
045	Lough Skale	F.	H309440	200	3	L	C
046	Topped Montain Lake	F.	H308453	200	3	L	C
047	Trien	F.	H153319	424	1	P	
048	Watson's Lough	F.	H307496	165	3	L	C
049	Annagh Lough	T.	H505504	90	3	L	F

050	Claraghmore Lough	T.	H356761	75	3	L	B
051	Curran, Lough Neagh	T.	H963792	15	6	LL	
052	Kiltagh Point, L. Neagh	T.	H957734	15	6	LL	
053	Teal Lough	T.	H730880	235	1	P	
054	Argory Ditches	Ar	H867578	15	na	D	
055	River Bann, Bannfoot	Ar	H961628	15	na	R	
056	Brackagh Bog	Ar	J020510	15	1	P	
057	Closet River	Ar	J048613	15	6	LL	
058	Closet Bay	Ar	J045620	15	6	LL	
059	Craigavon North Lake	Ar	J057580	25	5	L	I
060	Derrylard	Ar	H957615	20	3	L	J
061	Derryvore	Ar	J017567	15	1	P	
062	Edenknappagh	Ar	H923419	160	2	L	
063	Kinnegoe Pond	Ar	J061612	15	2	L	
064	Kinnegoe Bay, L. Neagh	Ar	J054614	15	6	LL	
065	Lurgan Park Lake	Ar	J093585	45	5	L	F
066	Marlaco Lake	Ar	H983447	60	4	L	F
067	Newry Canal	Ar	J0315113	15	na	C	
068	Selshion Moss	Ar	H985545	30	1	P	
069	Turmoyra Marsh	Ar	J056605	15	1	P	
070	Drumaroad, Dunturk Mtn	D.	J358451	155	2	L	
071	Blue Lough	D.	J327253	330	3	L	C
072	Cluntagh	D.	J485526	25	1	P	
073	Lackan Bog	D.	J237375	80	1	P	
074	Lagoon, Dundrum Bay	D.	J418392	0	na	CL	
075	Mallard Ponds	D.	J555490	45	1	P	
076	Lough Money	D.	J532452	30	5	L	J
077	Mountain Lake	D.	J328375	250	2	L	
078	Quoile Pondage	D.	J496474	4	na	CL	
079	Quoile Pondage	D.	J505488	4	na	CL	
080	Strand Lough	D.	J535474	5	na	CL	A
081	Ballygill Pond 1	An	D117527	85	1	P	
082	Ballygill Pond 2	An	D117527	85	1	P	
083	Ballygill Pond 3	An	D117527	85	1	P	
084	Bartins's Bay, L. Neagh	An	J073658	15	6	LL	
085	East Light Pool 1	An	D158521	65	1	P	
086	East Light Pool 2	An	D158521	65	1	P	
087	East Light Pool 3	An	D158521	65	1	P	
088	Evisk Lough	An	D195187	305	2	L	
089	Lough Fad	An	D255195	345	3	L	
090	Lough Fadden	An	D187420	185	3	L	C
091	Pool, Fair Head	An	D180446	175	1	P	
092	Pool, Fair Head	An	D184427	175	1	P	
093	Pools, Garron Plateau	An	D235195	340	1	P	
094	Upp Glenariff Mtn west	An	D226195	345	3	L	C
095	Upp Glenariff Mtn west	An	D231193	335	2	L	
096	Garry Bog	An	C940290	30	1	P	
097	Knockans pool	An	D125515	95	1	P	
098	Knockans pool	An	D126515	95	1	P	
100	Pool, Lemnalary	An	D268194	290	1	P	
101	Loughisland	An	D253198	345	3	L	
102	Loughnaweelan	An	D197187	315	2	L	
103	Montiaghs Moss	An	J093654	15	1	P	
104	Lough na Cranagh	An	D178428	125	4	L	D

105	Lough Natrosk	An	D273198	285	3	L		
106	White Park Bay	An	D026444	20	1	P		D
107	Ballynahone Bog	L	H860980	40	1	P		
108	Lough Beg	L	H975748	15	6	LL		
109	Lough A waddy	F	H041618	135	4	L		
110	Tullyvocady Lough	F	H060647	85	3	L		C
111	Lough Scolban	F	H005612	50	5	L		
112	Lough Keenaghan	F	G980600	55	5	L		I
113	Bannagh R., Lwr L. Erne	F	H137651	45	6	LL		I
114	Inver Lough	F	H520312	65	5	L		
115	Lough Aghery	D	J292538	115	5	L		I
116	Blacker's Rock, L Neagh	T	H9472	15	6	LL		G
117	Argory Moss	Ar	H878576	25	1	P		
118	Blackwater River	Ar	H865580	15	na	R		
119	Legalough	F	H088346	170	3	L		J
120	Corranny Lough	F	H478332	115	3	L		C
121	Jenkin Lough	F	H482403	275	4	L		C
123	Maghery, Lough Neagh	Ar	H924637	15	6	LL		
124	Maghery Canal	Ar	H924637	15	na	C		
126	Glastry	D	J638630	15	3	L		J
127	Gortalughany	F	H174303	230	na	R		
128	Drumanacabanagher	F	H208356	55	1	P		
129	Corraoash Lough	F	H256341	45	3	L		
136	Tullyframe sandpit	D	J262169	75	na	QP		
138	Rea's Wood, L. Neagh	An	J143855	15	6	LL		
139	Rea's Wood pond	An	J140853	15	1	P		
140	Inishcreenry, U. L. Erne	F	H297334	45	6	LL		
141	Loughdoo	T	H202741	175	2	L		
143	Drumgallan Bog	T	H304799	70	1	P		
144	Crockanaver Quarry	F	H226635	155	na	QP		
146	Raw Lough	F	H251618	150	3	L		C
147	Mullaghbane Moss	T	H735590	95	3	L		G
148	Carrick Lough	T	H724552	95	3	L		I
149	Carnteel Lough	T	H697546	105	3	L		G
150	Legane Lough	T	H737528	105	4	L		I
151	Turmenan	D	J485505	35	1	P		
153	Aughnadarragh Lough	D	J443595	65	3	L		C
155	Mill Pond	D	J128212	25	3	L		G
157	Breandrum Lough	F	H249431	45	3	L		I
165	Heron Lough	D	J497582	30	4	L		G
171	Peatlands Park B	Ar	H90604	15	1	P		
173	Derryleckagh	D	J117253	35	1	P		
176	Tullynawood Lough	Ar	H860299	210	5	L		C
177	Drumnahavil	Ar	H813285	165	1	P		
178	Augnagurgan Lough	Ar	H873311	205	3	L		C
181	Dungonnel Reservoir	An	D185714	285	na	RE		C
182	Cypress Pond	D	J324374	130	2	L		
187	Clea Lakes	D	J0550	20	5	L		
193	Cromaghy Lough	F	H513308	65	3	L		
195	Trory, Lwr. L Erne	F	H225480	45	6	LL		J
199	Greenan Lough	D	J119233	30	5	L		
202	New Lough	T	H499842	225	3	L		J
205	Pollan Burn	An	D251195	345	na	R		
207	Lough Keelan	D	J563453	25	3	L		



211A	Ballywoolen pool	L.	C789356	0	na	CL	
212	Scarva Lough	Ar	J060440	15	2	L	
213	Deer's Meadow, Spelga	D.	J277255	370	1	P	
215	Donnybrewer Level	L.	C520234	0	na	CL	
216	Lough Digh	F.	H323332	45	4	L	H
220	Selshion quarry	Ar	H983547	30	na	QP	
226	Lisadian quarry	Ar	H835467	45	na	QP	
227	Rocks Quarry	Ar	H870435	50	na	QP	
228	Castlecaldwell, L.L.Erne	F.	H020606	45	6	LL	
236	Carrickreagh quarry	F.	H175522	45	na	QP	
237	Carrickreagh, L.L. Erne	F.	H175523	45	6	LL	
240	Finn Floods	F.	H479208	50	na	D	
241	Ballyfinragh Lough	D.	J618548	10	3	L	F
242	Ballykine Lough (B)	D.	J356537	75	3	L	I
243	Creighton's Green Res	D.	J429785	125	na	RE	H
244	Drumquin Lough	T.	H327749	75	3	L	D
245	Edenderry	D.	J323684	10	1	P	
246	Killough Reservoir	D.	J526379	0	na	RE	A
247	R. Lagan, Barnetts Pk	An	J3268	10	na	R	
248	Lough Brickland	D.	J111411	95	5	L	F
249	Mullaghbane South	Ar	H990168	120	1	P	
250	Tullybrick Lough	Ar	H751398	35	3	L	J
251	Tullyratty Dam	D.	J566479	45	3	L	H
252	Hydepark Dam	An	J288818	145	na	RE	G
253	Abacon Lough	F.	H334254	45	4	L	H
254	Gibson's Lough	Ar	H984352	85	3	L	H
255	Lough Derg	F.	H268354	45	4	L	G
256	Loughaslane	Ar	H673781	230	3	L	B
257	Carran Lough	F.	H139477	55	5	L	I
262	Rossgweer Bog	F.	H187565	54	1	P	
263	Blacker's Rock, bog	T.	H9472	20	1	P	
264	Victoria Park Lake	D.	J367753	5	na	CL	A
265	Kilwaughter	An	D359011	160	3	L	
266	Straid Reservoir	An	J333927	145	na	RE	E
267	Lough Atona	F.	H110292	475	3	L	C
268	Derryboy Lough	D.	J472563	35	3	L	G
269	Stoneyford Reservoir	An	J217695	135	na	RE	I
270	Lough Bradan	T.	H085816	245	4	L	B
272	Lough Doo	D.	J611559	5	3	L	F
273	Roughan Lough	T.	H828688	60	5	L	I
274	Kilgarrow Lough	F.	H419220	45	4	L	H
275	Moyola Water A	L.	H962895	15	na	RE	I
276	Carrickavoy Lough	T.	H582494	165	3	L	D
277	Loughnashade	Ar	H852455	45	2	L	
278	Kilroosky Lough	F.	H495274	55	3	L	J
279	Carrigullian Lough	D.	J501585	30	5	L	I
280	Hen Mountain Pond	D.	J204276	310	1	P	
281	Green (Fardrum) Lough	F.	H177507	75	2	L	G
282	R. Blackwater, Benburb	T.	H812521	50	na	R	
283	Struell	D.	J513442	35	1	P	
284	Ross Lough	F.	H137467	55	5	L	H
285	Monlough	D.	J398649	105	3	L	C
286	Hollywood Low Reservoir	D.	J4104729	105	na	RE	F
287	Crom, Upper Lough Erne	F.	H358247	45	6	LL	

288	Lough Melvin	F.	H939520	30	6	LL	
289	Lough Bresk	F.	H201601	65	5	L	I
290	Mill Lough	F.	H337214	45	5	L	G
291	Lehinch Lough	F.	H392268	45	3	L	I
292	Derrykerrib Lough	F.	H405209	45	5	L	J
293	Lough Ross	Ar	H885155	85	5	L	D
294	Lough, Lemnalary Mtn	An	D266201	340	2	L	
295	Derrychara	F.	H236437	45	4	L	I
296	Lough Catherine	T.	H365840	55	5	L	D
297	Straghan's Lough	Ar	H823307	155	4	L	D
298	Ballyherly Lough	D.	J595525	25	4	L	H
299	Loughnacree	T.	H568788	195	3	L	C
300	Lough Drum	D.	J195321	95	3	L	F
301	Ballyvarnet Reservoir	D.	J476481	80	na	RE	J
302	The Long Lough	D.	J375559	75	4	L	G
303	Lough Nanskan	An	D110521	90	3	L	J
304	Castle Espie	D.	J492673	10	2	L	
305	Knockbreckan Reservoir	D.	J363662	105	na	RE	D
306	South Woodburn Res. B	An	J371888	195	na	RE	E
307	South Woodburn Res. C	An	J377892	155	na	RE	E
308	Lough Nacallagh	F.	H418235	45	5	L	G
309	New Dam, Upperlands	L	C873048	80	na	RE	E
310	Aghnahinch Lough	F.	H422239	45	3	L	I
311	Knockballymore Lough A	F.	H476268	55	3	L	J
312	Lough na heery	T.	H563445	300	3	L	B
313	Curran Bog	L.	H8795	45	1	P	

#### Abbreviations used

County		Area class (Ha.)		Habitat type	
Ar	Armagh	1	<0.25	L	Lake
An	Antrim	2	0.25-0.99	P	Pond
D	Down	3	1.0-4.99	LL	Large lake
F	Fermanagh	4	5-9.99	QP	Quarry Pond
L	Londonderry	5	10-249.99	D	Ditch
T	Tyrone	6	250+	R	River
				RE	Reservoir
				C	Canal
				CL	Coastal Site
				LT	Mercury vapour light trap

**Appendix 2 : Site list by survey number, listing Recorder number and species recorded**

Species are abbreviated to first two letter of generic name and first three of specific name, except for Sifni = *Sigara falleni* and Sifea = *Sigara fallenoidea*.

Site	Name	Recorder Number	Species recorded
001	Lough Acrussel	922	Nogla
002	Lough Alaban	1133	Vecap, Geodo, Nogla, Noobl, Copun, Helin, Sidis, Sisco
003	Lough Aleim	827	Geodo, Nogla, Hecas, Cawol
004	Ballintempo	812	Hesah, Sidis
005	Ballydoolagh Lough	921	Nogla, Coden, Copun, Capra, Sidis, Sifni
006	Lough Barry	580	Necin, Nogla, Coden, Capra, Sidis, Sifni
007	Black Lough	659	Capra
008	Braade	813	Liruf, Hesah
009	Camagh Bay, L.L.Erne	831	Necin, Coden, Capra, Sidis, Sifea
010	Lough Coole	597	Cybon, Copun
011	Corlatt, Upper L. Erne	941	Sidis, Sifni
012	Cornagogue Lough	736	Necin
013	Corraharra Lough	939	Necin, Nogla, Sifni
014	Lough Cushkeery	703	Necin, Arger, Capra
015	Cuilcagh pool system	821	Cawol
016	Derrymacrow Lough	929	Necin, Coden, Sifni
017	Lough Eyes	947	Geodo, Sidis, Sifos
018	Five Points Bog	824 or 1896	Hesah, Sinig
019	Friar's Lough	928	Necin, Sidis, Sifos
020	Glencreawan Lough	544	Sidor
021	Gortgranagh	933	Nogla
022	Gortmacconnell	825	Nogla
023	"Green Bottoms" Crom	940	Nogla, Sidis, Sidor, Sifni
024	Inisherik, Upper L. Erne	932	Hysta
025	Inishfendra, Upp. L. Erne	931	Hysta
026	Kilmacbrack Lough	954	Capra, Sidis, Sifni
027	Knockninny, Upp. L. Erne	916	Nogla, Copun, Capra, Sifni
028	Largalunny Lough	815	Gelac, Nogla, Hecas, Hesah, Sisco
029	Letter (Shean) Lough	163	Nogla, Copun, Capra, Sisem
030	Lower Lough Macnean	811	Hysta, Necin, Nogla, Arger, Capra, Sidis, Sidor, Sifni, Sifos
031	Lower Lough Macnean	823	Vecap, Mipow, Sifni
032	Meenloughabank	30/2	Necin
033	Mill Lough	915	Cybon, Coden, Capra
034	Monawilkin Lough	814	Vecap, Gelac, Nogla, Coden, Sidis
035	Moorlough	1908	Necin, Nogla, Capra
036	Lough Mulshane	949	Hysta
037	Lough Nabrickboy	699	Gelac, Necin
038	Lough Nabull	960	Hysta, Nogla, Copun, Capra, Sidis, Sisem
039	Lough Nalughoge	936	Necin
040	Lough Napeasta	702	Necin
041	Lough Narye	944	Hysta, Nogla, Sidis, Sifni, Sifos
042	Polasumera-River	826	Nogla
043	Rossdill Lough ditch -	1907	Gelac, Necin, Nogla
044	Rossdoney Quay	591	Sifni, Sifos
045	Lough Skale	948	Nogla, Copun
046	Topped Montain Lake	946	Gearg, Gelac, Capra, Sidis

047	Trien	828	Cawol
048	Watson's Lough	945	Necin, Nogla, Copun, Capra, Sifos
049	Annagh Lough	966	Nogla
050	Claraghmore Lough	950	Hysta, Miret, Liruf, Necin, Nogla, Sidis, Sidor, Sifos
051	Curran, Lough Neagh	994	Arger
052	Kiltagh Point, L. Neagh	995	Arger, Capra
053	Teal Lough	737	Gecos, Hecas, Sinig
054	Argory Ditches	1237/2	Gelac
055	River Bann, Bannfoot	991	Nogla
056	Brackagh Bog	2255	Hysta, Gelat, Necin, Nogla, Cybon, Coden, Hecas, Helin, Hesah, Sidis
057	Closet River	879	Capra, Sifea
058	Closet Bay	880	Sicon, Sidor, Sifea
059	Craigavon North Lake	874	Necin
060	Derrylard	990	Hysta, Geodo, Nogla, Helin, Sidor, Sifni, Sisem
061	Derryvore	1665	Geodo, Necin, Nogla, Helin
062	Edenknappagh	988	Geodo, Necin, Nogla, Copun, Capra, Sidis
063	Kinnegoe Pond	876	Geodo, Necin, Nogla, Copun, Capra, Sicon, Sidis, Sidor, Sifni
064	Kinnegoe Bay, L. Neagh		Arger, Capra, Sicon
065	Lurgan Park Lake	873	Nogla, Capra, Sifni
066	Marlaco Lake	987	Necin, Nogla, Coden, Arger, Capra, Sifni
067	Newry Canal	872	Hysta, Necin, Nogla, Capra, Sidor
068	Selshion Moss	989	Miret, Geodo, Necin, Nogla, Cybon, Sidis, Sisco
069	Turmoyra Marsh	878	Nogla, Sidor
070	Drumroad, Dunturk Mt.	729	Necin, Noobl, Helin, Sisco
071	Blue Lough	891/1	Hecas, Cawol
072	Cluntagh	901	Gearg, Geodo, Necin, Nogla, Cybon, Copun, Sicon
073	Lackan Bog	1642/2	Geodo, Nogla, Cybon, Hecas, Helin, Hesah, Sidis
074	Lagoon, Dundrum Bay	2263/3/3	Capra, Sicon
075	Mallard Ponds	909	Nogla, Copun
076	Lough Money	910	Necin, Nogla, Sidis, Sifni
077	Mountain Lake	892	Necin, Hecas, Sisco
078	Quoile Pondage	2257/14	Nogla, Copun, Sicon, Silat
079	Quoile Pondage	2257/14	Silat
080	Strand Lough	907	Nogla, Sista
081	Ballygill Pond 1	2267/11/1/1	Capra
082	Ballygill Pond 2	2267/11/1/2	Sidor, Sisco
083	Ballygill Pond 3	2267/11/1/3	Sidis, Sisco
084	Bartins's Bay, L. Neagh	881	Sifea
085	East Light Pool 1	856	Noobl
086	East Light Pool 2	2267/13/1/1	Coibe, Sisco
087	East Light Pool 3	2267/13/1/2	Coibe
088	Evish Lough	1577	Copun, Hesah, Cawol
089	Lough Fad	2287/7	Sisco
090	Lough Fadden	2273/2/2	Gecos, Nogla, Noobl, Coibe, Hesah, Cawol, Sisco, Sisem
091	Pool, Fair Head	2273/1/1	Cawol
092	Pool, Fair Head	2273/1	Sinig
093	Pools, Garron Plateau	2287/6	Glpro, Cawol
094	Upp Glenariff Mtn west	2287/3	Glpro, Hesah, Arger, Cawol
095	Upp Glenariff Mtn west	2287/2/32	Sinig
096	Garry Bog	112	Gelac, Necin, Noobl, Hecas, Sinig, Sisem
097	Knockans pool	2267/12/1/1	Coibe, Capra, Sidis

098	Knockans pool	2267/12/1/2	Coibe, Sicon
100	Pool, Lemnalary	2287/10	Nogla, Sisco
101	Loughisland	865	Sisco
102	Loughnaweelan	838	Nogla, Glpro, Hesah, Cawol
103	Montiaghs Moss	2209	Liruf, Gelac, Geodo, Necin, Nogla, Cybon, Glpro, Coden, Hecas, Helin, Hesah, Capra, Sidis, Sisco, Sisem. [Silat, Sidor, Sicon at light only]
104	Lough na Cranagh	840	Vecap, Necin, Hesah, Sisco
105	Lough Natrosk	1884	Arger, Sidis, Sisco, Sisem
106	White Park Bay	1573	Gecos, Sinig
107	Ballynahone Bog	516	Gelac, Hecas, Sinig
108	Lough Beg	998	Gelac, Getho, Nogla, Coden, Copun, Helin, Arger, Capra, Sicon, Sidor, Sifea, Sifos
109	Lough A waddy	818	Hysta, Vecap, Nogla, Sidor, Sisco
110	Tullyvocady Lough	817	Hysat, Gearg, Gelac, Nogla, Mipow, Sifni
111	Lough Scolban	819	Necin, Nogla
112	Lough Keenaghan	808	Gearg, Gelac, Hesah, Sidis
113	Bannagh R., Lwr .L. Erne	833	Hysta, Vecap, Gearg, Gelac, Geodo, Nogla, Mipow, Copun, Capra, Sifni
114	Inver Lough	964	Gearg, Necin, Nogla
115	Lough Aghery	889	Gearg, Necin, Nogla, Cybon, Capra
116	Blacker's Rock, L Neagh	996	Miret, Necin, Nogla, Copun, Helin, Capra
117	Argory Moss	1273/3	Gelac
118	Blackwater River	13010	Nogla, Sifni
119	Legalough	151/2	Hysta, Gearg, Gelac, Necin, Sisem
120	Corranny Lough	961	Gearg, Sidor, Sifos
121	Jenkin Lough	962	Capra, Sisco
123	Maghery, Lough Neagh	1933/1	Hysta, Vecap, Necin
124	Maghery Canal	1932/1	Nogla
126	Glastry	914	Geodo, Necin, Nogla, Helin
127	Gortalughany	1894	Vecap
128	Drumanacabanagher	920	Nogla
129	Corracoash Lough	919	Miret, Necin, Nogla
136	Tullyframe sandpit	887	Geodo, Getho, Necin, Nogla, Hemoe, Sidis
138	Rea's Wood, L. Neagh	223/1	Gelac, Nogla, Arger, Capra, Sicon
139	Rea's Wood pond	223/3	Miret, Geodo, Necin, Nogla, Sidor
140	Inishcreenry, U. L. Erne	918	Hysta, Miret, Geodo, Necin, Nogla, Cybon, Copun, Capra, Sidis, Sifni
141	Loughdoo	1963/1	Vecap, Nogla, Capra
143	Drumgallan Bog	2195	Necin
144	Crockanaver Quarry	926	Sidis, Sidor, Sifni
146	Raw Lough	617	Miret, Necin, Nogla, Sidis, Sisem
147	Mullaghbane Moss	973	Hysta, Miret, Nogla, Coden, Capra
148	Carrick Lough	972	Hysta, Gearg, Gelac, Nogla, Cybon, Capra, Sidis, Sifos
149	Carnteel Lough	968	Gearg, Geodo, Necin, Coden, Capra, Sifni
150	Legane Lough	1922	Miret, Nogla, Coden, Hesah, Capra, Sidis
151	Turmenan	1948	Gelac, Copun, Hesah
153	Aughnadarragh Lough	1604	Cybon, Coden, Hesah, Arger, Sifos
155	Mill Pond	883	Copun
157	Breandrum Lough	596	Nogla
165	Heron Lough	3688	Gearg, Gelac, Geodo, Helin
171	Peatlands Park B	984	Miret, Getho, Nogla, Copun, Hesah

173	Derryleckagh	2292/1	Heruf, Hysta, Miret, Geodo, Necin, Nogla, Cybon, Helin, Sidis, Sisco, Sisem
176	Tullynawood Lough	976	Sifni
177	Drumnahavil	975	Geodo, Necin, Nogla, Cybon, Helin, Sidis, Sisco
178	Augnagurgan Lough	978	Hysta, Geodo, Nogla, Sidis, Sifos
181	Dungonnel Reservoir	3514	Vecap
182	Cypress Pond	893	Capra, Sisco
187	Clea Lakes	1619	Nogla, Cybon, Copun, Capra, Sidis
193	Cromaghy Lough	963	Sidis, Sidor
195	Trory, Lwr. L Erne	924	Nogla, Capra, Sifea
199	Greenan Lough	884	Helin, Hesah, Sicon, Sidis, Sifos
202	New Lough	13012	Sisco
205	Pollan Burn	13004	Vecap
207	Lough Keelan	1617	Copun, Helin, Sidis
211A	Ballywoolen pool	2186	Copan, Copun, Capra, Sidor
212	Scarva Lough	2213	Sinig
213	Deer's Meadow, Spelga	2193	Hecas, Sinig
215	Donnybrewer Level	1857	Hysta, Gelac, Getho, Helin, Capra
216	Lough Digh	943	Geodo, Sifos
220	Selshion quarry	13009	Getho, Sinig, Sisem
226	Lisadian quarry	13007	Helin, Capra, Sifni, Sifos, Sisem
227	Rocks Quarry	13008	Copun, Hesah
228	Castlecaldwell, L.L.Erne	13011	Sifni, Sifea
236	Carrickreagh quarry	13006	Gelac, Getho
237	Carrickreagh, L.L. Erne	13006	Arger, Capra
240	Finn Floods	3076	Sidor, Sifni
241	Ballyfinragh Lough	2185	Capra, Sidor
242	Ballykine Lough (B)	1945	Gearg, Cybon, Coden, Hesah, Capra, Sidis, Sifos
243	Creighton's Green Res.	906	Capra, Sifni
244	Drumquin Lough	951	Cybon, Sifni, Sifos
245	Edenderry	2120	Geodo, Necin, Helin, Sidor
246	Killough Reservoir	2201	Copan, Sifni
247	R. Lagan, Barnetts Pk	2118	Gelac, Sidis
248	Lough Brickland	1628	Arger, Capra, Sifni
249	Mullaghbane South	2210	Geodo, Hecas, Sidor
250	Tullybrick Lough	970	Nogla, Cybon, Coden
251	Tullyratty Dam	2214	Gelat, Nogla, Copun, Hesah
252	Hydepark Dam	890	Sidis, Sifni
253	Abacon Lough	938	Hysta, Necin, Nogla, Sifni
254	Gibson's Lough	986	Nogla, Sifni
255	Lough Derg	917	Coden, Copun, Sifni
256	Loughaslane	969	Cybon, Capra
257	Carran Lough	829	Sidis, Sidor, Sifni
262	Rossgweer Bog	126	Hecas
263	Blacker's Rock, bog	13015	Gelat, Hecas
264	Victoria Park Lake	896	Nogla, Copun, Sicon, Sista
265	Kilwaughter	867	Sicon
266	Straid Reservoir	898	Copun, Arger, Sidis, Sidor, Sifni
267	Lough Atona	3986	Vecap, Nogla, Glpro, Arger, Cawol
268	Derryboy Lough	902	Capra
269	Stoneyford Reservoir	2285/2	Capra, Sifni
270	Lough Bradan	820	Capra
272	Lough Doo	3675	Capra
273	Roughan Lough	983	Coden, Sidis

274	Kilgarrow Lough	953	Coden
275	Moyola Water A	997	Cybon
276	Carrickavoy Lough	210	Cybon
277	Loughnashade	1926	Cybon
278	Kilroosky Lough	4095	Cybon, Copun, Helin
279	Carrigullian Lough	1618	Nogla, Cybon
280	Hen Mountain Pond	13013	Gecos, Copun, Sinig
281	Green (Fardrum) Lough	833	Gearg, Necin, Copun
282	R. Blackwater, Benburb	981	Aqnaj
283	Struell	1954	Vecap, Gelac
284	Ross Lough	830	Sifni
285	Monlough	1946	Hysta, Geodo
286	Hollywood Low Reservoir	3624	Sidor
287	Crom, Upper Lough Erne	620	Geodo, Mipow
288	Lough Melvin	2073	Mipow
289	Lough Bresk	925	Necin
290	Mill Lough	934	Necin, Nogla
291	Lehinch Lough	935	Necin
292	Derrykerrib Lough	955	Necin, Nogla
293	Lough Ross	974	Nogla
294	Lough, Lemnalary Mt.	2287/9/1	Necin, Sidis, Sisco
295	Derrychara	923	Nogla
296	Lough Catherine	952	Nogla, Sifni
297	Straghan's Lough	977	Nogla
298	Ballyherly Lough	1962	Sifni
299	Loughnacree	967	Noobl
300	Lough Drum	886	Sidis
301	Ballyvarnet Reservoir	905	Sidis, Sidor
302	The Long Lough	894	Sidis
303	Lough Nanskan	2267/14	Sidis
304	Castle Espie	1951	Sidis
305	Knockbreckan Reservoir	895	Sidor
306	South Woodburn Res. B	13003	Sidor, Sifni
307	South Woodburn Res. C	897	Sifni
308	Lough Nacallagh	958	Sifni
309	New Dam, Upperlands		Sifni
310	Aghnahinch Lough	957	Sifni
311	Knockballymore Lough A	959	Sifos
312	Lough na heery	965	Sisco
313	Curran Bog	13015	Miret, Gelac, Geodo, Nogla, Noobl, Copun, Hecas, Helin

### APPENDIX 3: NILS Water Chemistry Categories

The Northern Ireland Lake survey produced two classifications of the lakes within the province. One is based on the macrophyte flora and the other on chemical parameters. The Macrophyte classification divided the lakes into 16 categories, whilst the chemical classification produced 10. The distribution of individual species of aquatic heteropteran was compared to the chemical classification; this is summarised in the species accounts. The macrophyte classification was not looked at in depth as it has been shown that the aquatic fauna is related to chemical rather than botanical characteristics (Savage 1989). There is little evidence of any link between the macrophyte flora and the presence of surface-dwelling predatory species.

#### NILS Water Chemistry classification

There are ten types proposed which can be summarised as follows:

- A: This a saline group restricted to the vicinity of all the sea-loughs. They have high sodium levels, are alkaline and frequently with high phosphate enrichment.
- B: Upland base-poor lakes mainly in Fermanagh and Tyrone. These lakes were peat-stained mesotrophic lakes with low phosphate levels.
- C: Upland lakes that are broadly similar to B but with clearer water and less phosphate. Distributed in all upland areas.
- D: Similar to C but with greater levels of some chemicals, and less acid. Generally at lower altitudes, with most below 200m.
- E: Nearly all the examples of this group are man-made lakes with clear water high in nitrogen and magnesium. Mostly found in the eastern counties and most are reservoirs.
- F: These highly enriched lowland lakes are concentrated in north Down and south Fermanagh. They have high levels of phosphate.
- G: Less enriched than Group F lakes, but still highly eutrophic. Most are lowland with examples across the south of the province
- H: Less enriched than G. Found most commonly in Fermanagh and Armagh.
- I: Mesotrophic to moderately eutrophic lakes most common in Fermanagh, south-east Tyrone and western Armagh
- J: Predominately mesotrophic lowland lakes most commonly found in Fermanagh but with scattered records throughout. A significant number of these lakes are unenriched.



APPENDIX 4: Occurrence of species in each habitat type

Species	Total	Large lakes	Small lakes	Reservoirs	Ponds	Rivers	Other
<i>Noto glau</i>	87	5 (8 sites)	50	0	19	3	7
<i>Nepa cine</i>	55	4(5 sites)	35	0	12	0	3
<i>Call prae</i>	54	5(12 sites)	34	2	2	0	4
<i>Siga dist</i>	52	3 (4 sites)	32	3	10	1	2
<i>Siga feni</i>	46	3 (8 sites)	24	9	1	1	3
<i>Cori punc</i>	33	4(5 sites)	17	1	6	0	4
<i>Siga dors</i>	28	3(3 sites)	9	5	6	0	5
<i>Gerr odon</i>	27	2 (3 sites)	11	0	12	0	1
<i>Gerr lacu</i>	24	3 (3 sites)	9	0	7	1	4
<i>Cyma bons</i>	23	1(1 site)	14	1	7	0	0
<i>Siga scot</i>	22	0	14	0	8	0	0
<i>Hydr stag</i>	22	4 (6 sites)	12	0	2	0	2
<i>Cori dent</i>	21	2 (3 sites)	15	0	3	0	0
<i>Hesp sahl</i>	21	0	12	0	8	0	1
<i>Hesp linn</i>	20	2 (2 sites)	7	0	9	0	2
<i>Siga foss</i>	19	3 (3 sites)	15	0	0	0	1
<i>Arct germ</i>	15	4 (7 sites)	7	1	0	0	0
<i>Hesp cast</i>	15	0	3	0	12	0	0
<i>Gerr arge</i>	14	1 (1 site)	12	0	1	0	0
<i>Veli capr</i>	14	3(3 sites)	6	1	1	3	0
<i>Micr reti</i>	12	2 (2 sites)	5	0	5	0	0
<i>Siga conc</i>	12	2 (4 sites)	3	0	2	0	3
<i>Siga semi</i>	12	0	6	0	4	0	2
<i>Call woll</i>	10	0	6	0	4	0	0
<i>Siga nigr</i>	10	0	3	0	6	0	1
<i>Noto obli</i>	7	0	3	0	4	0	0
<i>Siga fdea</i>	7	3 (7 sites)	0	0	0	0	0
<i>Gerr thor</i>	6	1 (1 site)	0	0	2	0	3
<i>Cori iber</i>	5	0	0	0	5	0	0
<i>Glae prop</i>	5	0	3	0	2	0	0
<i>Micr powe</i>	5	4 (4 sites)	1	0	0	0	0
<i>Gerr cost</i>	4	0	0	0	4	0	0
<i>Gerr late</i>	3	0	0	0	3	0	0
<i>Limn rufo</i>	3	0	1	0	2	0	0
<i>Cori panz</i>	2	0	0	1	0	0	1
<i>Siga stag</i>	2	0	0	0	0	0	2
<i>Hesp moes</i>	1	0	0	0	0	0	1
<i>Siga late</i>	1	0	0	0	0	0	1
<i>Aqua najas</i>	1	0	0	0	0	1	0
<i>Hebr rufi</i>	1	0	0	0	1	0	0

**APPENDIX 5: Summary of status of aquatic Heteroptera in N. Ireland**

**WIDESPREAD ABUNDANT 1 species**

*Notonecta glauca*

**WIDESPREAD VERY COMMON 5 species**

*Nepa cinerea*, *Callicorixa praeusta*, *Sigara distincta*, *Sigara falleni*  
*Corixa punctata*

**WIDESPREAD COMMON 9 species**

*Sigara dorsalis*, *Gerris odontogaster*, *G. lacustris*, *Cymatia bonndorffii*,  
*Sigara scotti*, *Hydrometra stagnorum*, *Corixa dentipes*, *Hesperocorixa*  
*sahlbergi*, *H. linnaei*

**UNCOMMON 9 species**

*Sigara fossarum*, *Arctocorisa germari*, *Hesperocorixa castanea*, *Gerris*  
*argentatus*, *Microvelia reticulata*, *Sigara concinna*, *S. semistriata*, *S.*  
*nigrolineata*, *Callicorixa wollastoni*.

**RARE BUT LOCALLY COMMON 4 species**

*Sigara fallenoidea*, *Glaenocorisa propinqua*, *Micronecta poweri*, *Gerris*  
*thoracicus*

**RARE 9 species**

*Notonecta obliqua*, *Corixa iberica*, *Gerris costai*, *Limnopus*  
*rufoscutellatus*, *G. lateralis*, *Sigara stagnalis*, *Corixa panzeri*,  
*Hesperocorixa moesta*, *Sigara lateralis*

**SPECIES FROM UNDER-RECORDED HABITATS 3 species**

*Aquarius najas*, *Hebrus ruficeps*, *Velia caprai*