

Research and Development Series

Survey of Lough Neagh for *Stenus palposus* Ahrens and *Bembidion argenteolum* Zetterstedt

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Survey of Lough Neagh for *Stenus palposus* Ahrens and *Bembidion argenteolum* Zetterstedt

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Survey of Lough Neagh for *Stenus palposus* Ahrens and *Bembidion argenteolum* Zetterstedt

Introduction

Environment and Heritage Service is the lead partner for the UK biodiversity action plans for [Bembidion argenteolum](#) (Ahrens) and [Stenus palposus](#) (Zetterstedt). In 1996, a detailed survey of both species was carried out and then subsequent repeat surveys in 1997 and 2004.

This publication contains the main 1996 report, *The preliminary survey of the species' distribution and environment on Lough Neagh* with appendices, and a supplement of three further reports, *The re-survey of key sites in 1997*, *The survey of the species' distribution and environment on Lough Neagh, updated to 2004*, and *The report on the Stenus palposus and Bembidion argenteolum Action Plans, 1997-2002*.

Report One: Preliminary survey of the species' distribution and environment on Lough Neagh

1. Historical context

1.1 *Bembidion argenteolum* Ahrens

Bembidion argenteolum is widely but very locally distributed over northern Europe where it is restricted to fine sand habitats on the margins of freshwater. Within the British Isles there is a single recent record, for a coastal site in East Kent, relating to a putative immigrant or descendant of an immigrant (Hyman and Parsons 1992). Older records exist for native populations at several sites on Lough Neagh in Northern Ireland. These populations are clearly relict and isolated by a considerable distance of both land and sea from the nearest inhabited Continental stations.

The first confirmed record of this species on Lough Neagh is that of Johnson (1899) who reported the capture of several specimens (initially as *Bembidion paludosum* (Panz.) = *litorale* (Oliv.)) from Ardmore on the southern shoreline. There are older Lough Neagh records of "*Bembidion paludosum*" which undoubtedly refer to the same species i.e. Patterson (1838) for Shane's Castle on the north-east shore, Dawson (1854) for Lough Neagh, unlocalised and Haliday (1885) for "near Belfast" taken as meaning Lough Neagh. Johnson (1914) subsequently reported this species from Glenavy on the eastern shore of the Lough on the basis of records made the late H. L. Orr. Halbert (1910) refound the species at Shane's Castle and the most recent record is that of Janson (1924) for the same locality.

There are 3 W. F. Johnson specimens in the Ulster Museum (UM) labelled "Ardmore, L. Neagh" and dated 19 June 1899. There is a single specimen in the National Museum of Ireland (NMI) for the same locality and date and 2 labelled "Lough Neagh", dated 28 June 1902 and attributed to C.W. Buckle. A further 3 Johnson specimens in NMI are labelled Lough Neagh but without locality or date. Finally, 6 O.E. Janson specimens in NMI are labelled "Shane's Castle" and dated 20 June 1923. The latter are the most recent specimens known to have been collected on the Lough and their capture is recorded by Janson (1924). No doubt some of the material listed above also has its counterparts in British collections.

1.2 *Stenus palposus* Zetterstedt

This species was first reported by Johnson (1895) on the basis of specimens forwarded to him by H. L. Orr and said to have been collected somewhere between Toome and the mouth of the Ballinderry River in the north-west corner of the Lough. Both Halbert (1910) and Janson (1924) subsequently reported the species from beaches at Shane's Castle, but the Orr report was never further

investigated. Apart from a curious and probably mistaken record by Nicholson (1910) for a reedbed at Balrath Co Meath, there were no further reports until Anderson (1979) refound the species between Toome and the mouth of the Moyola River in the north-west of the Lough.

This colony occupied a beach of about 150m length in an area which had previously been exploited by sand extractors and has several water-filled sand-pits from very small to large (>5ha) size behind the shoreline. At the time of the discovery the beach was 5-10m in depth with a damp-sand shoreline of 1-4m depth and a drier sand deposits behind this of 3-8m depth. *Stenus palposus* was first encountered on 21 May 1977 in mid afternoon on a warm day on the damp sand area, 1-3m from the water's edge. Densities of up to 10 per m² were observed along the central 40-50m of beach. Total population size was not estimated but may have been 1-2000. Fine sand beaches on either side of this beach located at H970902 were visited on this and subsequent occasions but the species was not encountered. Total records for this beach are as follows:

- 21 May 1977: warm, bright sunshine; several hundred observed
- 20 May 1978: similar conditions; 20-30 observed
- 17 May 1980; similar conditions; 10-20 observed
- 19 June 1983; similar conditions; 2 only found

Subsequent visits to the site on 17 May 1985, 14 May 1996 and 1 June 1996 failed to produce further specimens of this species. Beaches at Shane's Castle have been visited on a number of occasions (Anderson 1979) but neither *Stenus palposus* nor *Bembidion argenteolum* have been encountered. Nor has either species been encountered at other sites on Lough Neagh.

2. The present survey: methodology and scope

2.1 Scope

The survey is a first step to determine the existence or otherwise of remnant colonies of the target species. Initially, the western and southern shores of Lough Neagh were to be examined. These areas are generally difficult of access and not well known faunistically and were considered to hold the best hope of discovering some heretofore unknown sites. The survey would include examination of the only recent site for *Stenus palposus* east of Moyola Waterfoot (H970902).

An attempt would be made to describe the beaches within the survey area in terms of their suitability for the target species, in terms of perceived threats to their fauna and in terms of current fauna. At the outset the study area was divided into a total of twenty-four units likely to hold suitable sandy beaches. This disposition was arrived at by close examination of aerial photographs of the Lough shore which had been taken to assist ASSI designation (DOENI). As it turned out, a total of twenty-four beaches were found and surveyed although some of the initial units proved to lack suitable habitat. Beaches were mainly located at the outflow of the Lough between Toome and Moyola Waterfoot in the north-west corner, around Ballinderry Waterfoot halfway down the western shore and west of Ardmore Point on the southern shore.

The Ardmore localities are probably those visited by Johnson (1899 and subsequently). They were not located during the survey of Anderson (1979) who mistakenly concentrated on Ardmore Point, an area of stony, well-vegetated lakeshore to the east. With the possible exception of Orr, who supplied the first specimens of *Stenus palposus* to Johnson and Halbert (1902), extensive beaches around Ballinderry Waterfoot had not previously been visited by an entomologist and were an important focus during the survey. Finally, the extensive beaches between Moyola Waterfoot and Toome were looked at in more detail and provide an interesting point for comparison with the earlier survey of Anderson (1979) who documented the fauna of the *Stenus palposus* beach, and with lists compiled for several nearby beaches in the nineteen-seventies and nineteen-eighties (Anderson, unpublished).

2.2 Methodology

Once located, beaches were assessed for fauna, current management, possible threats to fauna, size and character. Fauna was collected manually by splashing lake water on to the shoreline and collecting fauna washed out, by examining driftwood, cast chironomid skins and other litter along and above the tide line, and by examining sand under larger objects deposited on dry sand above the shoreline. Not more than two hours was spent in assessing any given beach although time spent varied with the size and importance of the beach. Beach length, beach composition in terms of sand type, the presence of grazing animals, the presence of animal carcasses, the presence of significant

accumulations of rotting algae and evidence of recent storm damage were assessed.

A list of beaches with size, location etc. is given in Appendix I. Beach faunas are listed in Appendix II.

3. RESULTS

3.1 Categories of beach fauna

Results of the faunal survey are given in Appendix II, with species lists given for each of the beaches surveyed. Beaches are coded LNFSB 1-24 [LNFSB = Lough Neagh fine sand beach]. Survey results and personal observations suggest that the following broad categories of behaviour within the fauna:

3.1.1

Category 1: fauna predatory primarily along water margins

Elaphrus riparius
Agonum marginatum

3.1.2

Category 2: fauna predatory on or in damp sand ½-3m back from water margins

Saldula saltatoria

Clivina fossor
Dyschirius obscurus
Bembidion aeneum
Bembidion bipunctatum
Bembidion guttula

Bembidion mannerheimi
Bembidion monticola
Bembidion pallidipenne
Bembidion punctulatum
Agonum albipes

Stenus boops
Stenus canaliculatus
Stenus crassus
Stenus melanopus
[*Stenus palposus*]
Gyrohypnus fracticornis
Gyrohypnus punctulatus
Xantholinus linearis
Xantholinus longiventris
Philonthus albipes
Philonthus quisquiliaris
Gabrius nigrifulus
Gabrius pennatus
Tachyporus chrysomelinus

Tachyporus nitidulus
Tachyporus pusillus
Tachinus signatus
Cordalia obscura
Gnypeta carbonaria
Aloconota gregaria
Aloconota insecta
Amischa analis
Amischa soror
Atheta atramentaria
Atheta amplicollis
Atheta graminicola
Atheta melanocera
Aleochara bipustulata

3.1.2.1 The composition of this list is rather arbitrary and reflects the composition of species lists in Appendix II. Very few of these species are stenotopic for sandy shorelines and most are eurytopic or associated with a particular niche such as

animal dung or carrion. It is not profitable with current knowledge of the behaviour of many of the smaller and more obscure species to make detailed cases for inclusion or removal.

3.1.2.2 It is, however, worth indicating the species of greatest abundance and widest occurrence. The shore bug *Saldula* is almost ubiquitous but hardly requires further comment. Of the carabids, *Bembidion pallidipenne* is the most frequent and nearly ubiquitous, but might be expected in this habitat which is very similar physically to that which it occupies on coastal sands. Lindroth (1985) describes it as halophilic and rare inland in Scandinavia. Of the remaining species *Bembidion bipunctatum* probably only occurs as a vagrant from stony or muddy shorelines where it is much more common, as is also the case with *B. punctulatum*, but *B. monticola*, though rare, may prefer sandy shorelines. The latter is described as preferring fine sand or clay, usually in shaded situations, on Scandinavian rivers (Lindroth *op. cit.*). Of seven post-1970 records for Northern Ireland, two are for relatively shaded riverine habitats and five for Lough Neagh sandy shorelines.

Among the Staphylinidae, *Stenus melanopus*, *S. crassus* and *Tachyporus pusillus* were the most widely recorded and abundant. The first two are primarily thermophilic and relatively widespread if local in compost but apparently do not occur in fine sand habitats outside Lough Neagh. The thermal retention characteristics of fine sand are discussed in a Lough Neagh context by Anderson (1979). Krogerus (1932) has made an in depth study of this aspect of fine sand faunas in Finland. The abundance of *Tachyporus pusillus* in this habitat is interesting but difficult to account for.

3.1.3

Category 3: algae-feeding or scavenger fauna of damp sand and litter ½-3m back from water margins	
<i>Helophorus brevipalpis</i>	
<i>Cercyon marinus</i>	
<i>Megasternum obscurum</i>	
<i>Lesteva longoelytrata</i>	<i>Bledius subterraneus</i>
<i>Deleaster dichrous</i>	<i>Carpelimus corticinus</i>
[<i>Bledius annae</i>]	<i>Anotylus rugosus</i>
<i>Hypnoidus riparius</i>	
<i>Zoroachros minimus</i>	

3.1.3.1 The species included within this category are widespread in damp sand areas and known either to be entirely herbivorous or scavengers with some herbivorous tendencies i.e. they are not overtly predatory. As such, some provide an opportunity for predation by species in Category 2. Thus Johnson and Halbert (1902) surmised that *Dyschirius obscurus*, which is known to predate

species of the staphylinid genus *Bledius*, was feeding on *Bledius subterraneus* on Lough Neagh. This may be true where the two species occur together and appeared to be confirmed by the observations of Anderson (1979) but the present results are contradictory on this question. Some of the species in this Category are considered in more detail in Section 4.

3.1.4

Category 4: fauna predatory primarily on drier sand well behind the shoreline
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Arctosa perita

[*Bembidion argenteolum*?]

Amara fulva

Anthicus scoticus

3.1.4.1 The decision to place *Bembidion argenteolum* in Category 4 was taken on balance. There may in fact be a dichotomy between the resting and breeding places of this species which according to Lindroth (1985) are at some distance from the water's edge on fine and rather dry sand on Scandinavian rivers, and the places where it feeds. Johnson and Halbert (1902) refer to its similarity in life to an *Elaphrus* and its predisposition to take to flight which immediately suggests an active species found close to the water line. Other than this there are no direct observations of the behaviour of this species on Lough Neagh. Apart from Johnson (1899) most collections seem to have been made in poor weather when the species was found under objects along the shoreline, rather than at some distance behind it.

Arctosa perita burrows in fine dry sand behind the damp sand water margins and has not been observed elsewhere on beaches. Although *Anthicus scoticus* has a predisposition to feed on dry sand over which it travels at high speed during sunny weather, it may also found feeding among drift on damp sand on most beaches where it occurs. *Amara fulva* is stenotopic for shifting dry sand both on Lough Neagh and coastal locations around British coasts, and being nocturnal, is usually found buried in the sand or under objects during the day. There are six sites for the species on Lough Neagh at which it has been found buried in dry sand at two and under wood on dry sand at four.

3.1.4.2 Most other fauna encountered on sandy shorelines are vagrants from other habitats. The large amount of woody drift on shorelines provides shelter and food for eurytopic cryptozoic fauna such as the millipedes *Tachypodoiulus niger* and *Cylindroiulus latestriatus* or the woodlouse *Porcellio scaber*. Characteristic inhabitants of shaded, woodland habitats such as *Bembidion harpaloides* and *Cylindroiulus brittanicus* sometimes also occur. Typically, only fauna capable of withstanding drier, more exposed conditions are represented

i.e. *Cylindroiulus latestriatus*, a coastal dune species in N. Ireland rather than the closely related *C. britannicus* which favours humid forest ecotopes.

At river estuaries there may be considerable accumulations of farm animal carcasses on beaches. This was particularly so at LNFSB 12. Near the water line these are often sterile but further up are occasionally colonised by a terrestrial necrophilous fauna. It is unclear whether the rare and threatened *Thanatophilus dispar* depends on this food source as, in the two sites in which it was found during the survey, it occurred under driftwood (LNFSB 13: Ballinderry Waterfoot) and under a dead gull (LNFSB 19: Derrywarragh Island) rather than at large carrion which was available. Johnson and Halbert (1902) report it being found near Ardmore under dead fish. Coleoptera found at carcasses included *Saprinus aeneus*, *Necrobia violacea*, *Omosita colon* and *Aleochara bipustulata*. The feeding habits of *Aleochara bipustulata*, which is widespread under drift on beaches, would seem to be wider than those reported in the literature, the usual animal dung and carcasses being absent or scarce on many beaches. Of the carcase species, only *Necrobia violacea* and *Omosita* spp are relatively widespread on the Lough in this habitat (Anderson, unpublished).

Other fauna frequently occurring on beaches are the phytophagous leaf beetles and weevils whose food plants grow in the more permanently dry loose sand areas at the back of beaches. *Gastrophysa polygoni* occurs locally on various *Polygonum* but mainly *P. persicaria*, along with the weevil *Phytobius quadrituberculatus*, and *Gastrophysa viridula* on docks *Rumex* spp. These plants also attract the aphidophagous ladybirds *Coccinella septempunctata* and *C. undecimpunctata*. The latter was abundant in places along the north-west shoreline of the Lough. Elsewhere in Northern Ireland it is a largely coastal species.

The remaining phytophagous species are judged to be vagrant from nearby wetland habitats.

3.1.5 The last category, Category 5, was devised to consider all those species which are, from observation, or the literature, confined to sandy riverine or lacustrine habitats.

Category 5: fauna stenotopic for fine sand habitats

	status
<i>Arctosa perita</i>	Also coastal; widespread but local
<i>Dyschirius obscurus</i>	RDB2(Britain); L. Neagh; SE England
[<i>Bembidion argenteolum</i>]	RDBK(Britain); L. Neagh, Sussex
<i>Bembidion monticola</i>	Nb; northern, streambanks
<i>Bembidion pallidipenne</i>	Nb; widespread, coastal; v. localised
<i>Amara fulva</i>	Nb; widespread, coastal; local and rare
<i>Stenus crassus</i>	Local; thermophilic - also in compost
<i>Stenus melanopus</i>	Local; thermophilic - also in compost
[<i>Stenus palposus</i>]	L. Neagh only
[<i>Bledius annae</i>]	Nr(Scotland); streambanks
<i>Bledius subterraneus</i>	Local; northern, on streambanks
<i>Tachyusa umbratica</i>	Local; northern and western [1st Irish record, present survey]
<i>Anthicus scoticus</i>	RDB3; mainly northern, coastal salt-marshes outside L. Neagh

3.1.5.1 Of the fourteen species listed five also occur along sea coasts, four occur along sandy or gravelly streambanks, two are thermophilic in a wide sense and occur in artificial habitats such as compost in addition to fine sand, leaving only three which are restricted to Lough Neagh fine sand habitats. Of these, *Dyschirius obscurus* is still widespread enough to be considered beyond immediate danger but the other two, *Bembidion argenteolum* and *Stenus palposus*, are threatened or possibly extinct and therefore the subject of the present study.

4. ADDITIONAL SPECIES ACCOUNTS

Background information on a selection of species is discussed in more detail below.

4.1 *Pelophila borealis* (Paykull)

This is a circumboreal carabid rarely found south of latitude 60°N, except in the British Isles. There is a single recent record for the East Highlands of Scotland but the species is otherwise confined to the Orkneys and Shetlands, and to Ireland (Hyman and Parsons 1992). There are 25 individual sites listed on the RECORDER database for Northern Ireland (CeDAR, Ulster Museum). Of these, no less than 18 are for Lough Neagh and peripheral wetlands. It appears to be equally widespread on Lough Erne and there are scattered records for elsewhere in Cos Down and Fermanagh. Lough Neagh is clearly an important local centre of distribution.

It does not, however, come into consideration here although recorded at six sites during the survey (Appendix II). It is largely confined to vegetated lakeshore mud or silty sand and as such peripheral to the sandy shore fauna.

4.2 *Dyschirius obscurus* (Gyll.)

Much has been said in the literature about the dependence of *Dyschirius* species upon the burrowing staphylinid *Bledius* for prey. During the survey *Dyschirius obscurus* was recorded at 12 of the 24 sites, but a *Bledius* species (*B. subterraneus*) was recorded at only 3 where *Dyschirius* occurred (Moyola River Estuary and two sites at Ardmore; Appendix II). It seems unlikely, therefore, that *Dyschirius obscurus* on Lough Neagh has an obligate association with *Bledius*. More research is needed to confirm alternative food sources. Lindroth (1974, 1985) gives *Bledius fergussoni* Joy as the usual prey in Continental habitats, but although this species is widespread on the coast in Ireland it is not recorded from inland habitats or from Lough Neagh (Johnson and Halbert 1902; RECORDER database).

4.3 *Bembidion pallidipenne* (Ill.)

This species is strictly confined to sandy shorelines and was found on one beach less than 2m across during the survey. It was also found in 22 out of the 24 sites visited and is therefore likely to be at or near saturation in Lough Neagh habitats. At many sites densities were high, probably at the levels indicated by Anderson (1979) for the Moyola Far Waterfoot sites (40 per m²). Its abundance here contrasts with its rarity and low numbers on sea coasts in N. Ireland (1 recent site only).

4.4 *Orectochilus villosus* (Müller)

This whirligig is found along larger rivers and lakes and, according to Holmen (1987) can tolerate rather polluted water. It is nocturnal and hides under stones etc. along banks during the day. Teneral specimens were found on beaches at Ballinderry Waterfoot (LNFSB 11 and 14) under wood drift on fine sand.

4.5 *Cercyon marinus* Thoms.

This hydrophilid was recorded from 12 of the 24 sites. It is thus the most widespread of the group encountered. There are older records for Shane's Castle (Halbert 1910) and near Lurgan (Sharp 1910). It was considered rare by Johnson and Halbert (1902) but appears to be much less so at present.

4.5.1 A curious specimen was collected at Traad Point (LNFSB 10) with broad and concave mesosternal process which may turn out to be referable to *C. bifenestratus* Küster, not heretofore an Irish species.

4.6 *Deleaster dichrous* (Grav.)

Recorded from 10 sites in the survey, this large and conspicuous staphylinid was reputedly very rare at the time of Johnson and Halbert (1902) but has become widespread in a variety of lakeshore and streambank habitats since the early 1980s (Anderson 1982, 1987). It usually occurs in leaf litter in relatively shaded places but was present at a number of sites under driftwood on the strand line of sandy beaches.

4.7 *Bledius subterraneus* Erich.

It is remarkable that, despite its abundance on beaches between Moyola Waterfoot and Toome in 1977 and 1978 (Anderson 1979), this species could not be detected in this area during the survey. A single specimen was washed from beach sand on the banks of the Moyola River to the south (LNFSB 8) but the species was otherwise only seen on beaches between Blackwater Waterfoot and Ardmore Point on the south shore of the Lough. The disappearance of this species and *Bledius annae* from the north-west shore is difficult to account for.

4.7.1 These disappearances may be connected to the apparent disappearance of *Stenus palposus* from LNFSB 6 in this area during the same period. Personal observation of conditions on the beaches between Moyola Waterfoot and Toome between 1980 and 1996 suggest that some important changes may have taken place. On LNFSB 6 the area of fine, loose sand has decreased considerably. Between visits on 14 May and 1 June 1996 erosion of this area was observed at first hand from the effects of south-easterly gales. The preponderance of gales from this unusual direction has been a feature of local weather since 1990 and may have not only reduced the dry sand back-beach area but also affected the beach fauna directly. This could account for the disappearance of some species. *Bledius subterraneus* is a normal constituent of sandy riverbank faunas in rivers such as the Moyola and may be expected to re-colonise the vacated Lough Neagh beaches eventually. Is it possible that the same may be true of *Stenus palposus*?

4.8 *Stenus melanarius* Steph.

One of the most elusive Irish Steninae (Staphylinidae). Anderson (1984) gives one recent site on a peaty hill top in Fermanagh and Johnson and Halbert (1902) one site in a marsh near Londonderry. Its true habitat preferences are unknown. A single male was taken under drift on coarse sand at Moyola Waterfoot (LNFSB 9).

4.9 *Tachyusa umbratica* Erich.

A male of this species was taken running on damp sand on the south bank of the Ballinderry River (LNFSB 14). It is an addition to the Irish list. There is little information in the literature on its habits but Duff (1993) gives caves on sandy riverbanks as its habitat in Somerset.

4.10 *Amischa forcipata* Muls. & Rey

A single female of this species was taken under driftwood on a long beach near Ballinderry Waterfoot (LNFSB 12). This also is an addition to the Irish list about which little has been published. Duff (1993) describes it as a species of wet litter near freshwater.

4.11 *Anthicus scoticus* Rye

The distribution of this species on Lough Neagh is strongly biased towards the north-west corner. However, Johnson and Halbert (1902) report a record of Buckle for Shane's Castle in the north-east. Curiously neither Halbert (1910) nor Janson (1924) appear to have seen it at Shane's Castle, nor has the present author. Where it occurs it is an abundant and conspicuous member of the beach fauna.

5. SITE CHARACTERISTICS AND SUITABILITY FOR TARGET SPECIES

The sites and their characteristics are listed in Appendix I

5.1 Criteria of suitability from published observations

Criteria of suitability for *Stenus palposus* and *Bembidion argenteolum* differ in some respects. Observations of the behaviour of *Stenus palposus* suggest that it prefers damp areas of open fine sand beaches (Anderson 1979). *Bembidion argenteolum*, according to Lindroth (1985) is a species primarily of dry, loose sand in back-beach areas. There is little in the literature on the behaviour of the latter on Lough Neagh but it seems reasonable to assume that beaches should at least have a moderate area of back-beach loose sand.

5.2 Criteria from recorded biodiversity

A more important refinement of selection for suitability would be the presence of other members of the stenotopic fine sand fauna (3.1.5). Species within this category are listed in parentheses for each beach site in the last column of Appendix I. Out of a maximum score of 13, the highest scores in the survey were 7 (LNFSB 14; Ballinderry Waterfoot) and 6 (LNFSB 7, 8, 13, 23 and 24). It is worth noting that the recent *Stenus palposus* site at LNFSB 6 is not included in these higher categories, a result of its loss of both *S. palposus* and the *Bledius* species. The reasons for these losses are explored in Section 4 under notes on *Bledius subterraneus* (4.7).

5.3 Recommendations

Bearing in mind the history of the target species, it seems likely that *Stenus palposus* would only re-occur in those sites close to previous occurrences i.e. at LNFSB 7 and 8 and possibly also 13. Conversely, since *Bembidion argenteolum* has never been reported from the north-west of Lough Neagh, these sites, although possessing suitable back-beach areas, are not likely to yield this species. This leaves only LNFSB 23 and 24 as suitable for the latter. Future recording should therefore be concentrated on the sites enumerated for the respective species.

5.4 Ancillary conservation targets

There are other important fauna on the Lough apart from the current target species. These have been discussed in the two previous sections. Conservation priority should be given to the most important habitats, which on present evidence are LNFSB 7, 8, 13, 14, 23 and 24. To these I would add LNFSB 4 and 12, which, though scoring lower in the ratings, have excellent back beach areas and may eventually yield more of interest. Back-beach areas may, incidentally, be important to more than just the specialised loose sand fauna. There is some evidence to suggest that they are important for over-wintering of many stenotopic beach species (Anderson, unpublished).

5.5 Site management priorities

Weather and physical conditions on the Lough mostly dictate the structure of beaches and there is little that can be done to manage gross physical layout. Factors which may influence the conservation value of beaches and be more responsive to management are

- (i) control of inshore sand dredging which may affect the supply of beach sand locally
- (ii) control of physical disturbance by trampling animals or human beings during the summer period
- (iii) control of the colonisation of back-beach and beach areas by willow and alder scrub which may shade out suitable habitats.

5.6 Problems at specific sites

Specific problems identified during the survey additional to those given above and in Appendix I are listed below:

- 1) It is possible that inshore dredging has contributed to the perceived problems on beaches between Moyola Waterfoot and Toome but there was no first hand evidence of this. A watching brief should be kept on dredging activities here.
- 2) Rubbish was a problem in the vicinity of LNFSB 5 due to the deliberate dumping of household and other waste into Lough Neagh by the owners of McCann's Sand Plant at this location.
- 3) Leaf beetles and weevils associated with back-beach areas were lacking at LNFSB 8 due to herbicide application by a local farmer intent on 'improving' a ryegrass ley backing on to the beach.
- 4) The beach which formerly existed between LNFSB 6 and 7 has been destroyed by the dumping of hardcore by a landowner intent on providing a harbour in a flooded sand pit at this location. About 300-400m of beach are involved. This area was described as the 'long beach' by Anderson (1979) but had to be omitted from the present study due to damage.
- 5) Gross disturbance by cattle and farm waste and hardcore dumping was observed at LNFSB 15. [The question of the effects of cattle trampling is difficult to assess. Trampling was very evident at LNFSB 11 but the fauna was relatively diverse compared with the completely protected LNFSB 12. Cattle may increase diversity in some aspects of the fauna eg. coprophilous beetles, but may reduce the incidence of more sensitive beach fauna if sufficient back-beach herbaceous rough is not present. At LNFSB 11 there was abundant cover from alder saplings and herbaceous rough which may account for the higher biodiversity].
- 6) The opening up of a carpark and physical removal and/or shifting of beach sand has largely defaunated small beaches at this location described in Anderson (1979).
- 7) Algal accumulation on the waterline and rank undergrowth of alder in back-beach areas are affecting the value of beaches at Ardmore, LNFSB 23 and 24. There is also some evidence of activity by people driving 'beach buggies' at the sand plant end of LNFSB 24.

6. SUMMARY

6.1 The survey failed to find any extant populations of *Stenus palposus* or *Bembidion argenteolum* on Lough Neagh.

6.2 A great deal of information was nevertheless recorded on suitable sites for these and other stenotopic species on the north, west and south shores of Lough Neagh (Appendices I and II).

6.3 This additional information suggests that conditions on the Lough are, very locally, still suitable for both target species.

Sites suitable for *Bembidion argenteolum* are LNFSB 23 and 24.

Sites suitable for *Stenus palposus* are: LNFSB 7, 8, 13 (Moyola and Ballinderry Waterfoots).

7. RECOMMENDATIONS

7.1 Sites should be managed according to the recommendations in **5.5** and **5.6**.

7.2 Sites at LNFSB 7, 8 and 13 should be re-visited in 1997 and subsequent years to assess the fauna and possible presence of *Stenus palposus*. Visits should be conducted in mid to late May i.e. at slightly earlier dates than was possible in 1996.

7.3 Sites at LNFSB 23 and 24 should be re-visited in 1997 and subsequent years to assess the fauna and possible presence of *Bembidion argenteolum*. Visits should be in mid to late May as *B. argenteolum* appears early and may have been overlooked in 1996.

7.4 The remaining suitable beach sites on the east and north of Lough Neagh should be visited in 1997 to assess fauna and suitability for the target species.

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APPENDIX I
SITE CHARACTERISTICS

SITE and Lough Neagh Fine Sand Beach (LNFSB) No.	VC	Grid Ref.	Date of visit	Beach length (approx. m.)	Substratum type	Dry sand areas	Cattle present (+/-)	Rubbish /carrion /algae	Species totals [Category 5]	Other Comment
1. Toome Spit	H39	H989897 H990897	1 June	90	Fine sand, silt	-	-	Reed litter	35 [4]	
2. Toome Weir	H39	H988901 H988902	1 June	90	Fine sand	(+) overgrown	-	-	15 [5]	
3. Scott's Sand Plant	H40	H984903	1 June	140	Fine sand, gravel	(+) disturbed	-	-	20 [3]	
4. The Creagh Spit	H40	H981903 H982903	1 June	350	Fine sand, silt	++	-	Plastic rubbish	36 [4]	Good dry sand areas.
5. McCann's Sand Plant	H40	H978903 H979903	1 June	150	Fine sand	+	-	Plastic rubbish	16 [3]	
6. Moyola Far Waterfoot North	H40	H970902	1 June	150	Fine sand	+ overgrown	-	-	45 [5]	
7. Moyola Far Waterfoot South	H40	H968899	6 June	200	Fine sand	+ coarser sand	-	Reed litter/carrion	25 [6]	
8. Moyola River, north bank	H40	H964904 H965904	6 June	200	Fine sand	++	-	-	39 [6]	Good dry sand areas
9. Moyola Near Waterfoot	H40	H961892	6 June	200	Fine sand, gravel, humus	- humus	-	reed litter	38 [6]	

10. Traad Point	H40	H957870	6 June	15	Fine sand, silty mud	- overgrown	-	-	17 [4]	Overgrown.
11. Salters Castle	H40	H953819 H953820	14 June	180	Fine sand, gravel	- trampled	-	-	20 [5]	Overgrazed.
12. Berryman's Hill	H40	H953914 H953815 H953816	14 June	450	Fine sand, gravel	+++	+	Plastic/carrion	27[5]	Excellent dry sand areas.
13. Ballinderry Far Waterfoot	H40	H955811	6 June	200	Fine sand	+++	-	Carrion	41 [6]	Excellent dry sand areas.
14. Ballinderry Near Waterfoot	H36	H954810 H955810 H956810	14 June	300	Fine sand	++	-	-	34 [7]	Good dry sand areas; small pools.
15. Kinturk Bay	H36	H956804 H956805	14 June	350	Fine sand, gravel	(+) trampled	+	Misc. rubbish/farm waste	12 [4]	Very disturbed and trampled.
16. Newport Trench	H36	H965769	14 June	100	Fine sand	+ disturbed	-	-	3 [1]	Humanly disturbed
17. Doon Point	H36	H901664	20 June	10	Humus, fine sand	-	-	Algae	11 [2]	
18. Derryloughan	H36	H917647	26 June	10	Humus, fine sand	-	-	Algae	11 [2]	

19. Derrywarragh Island	H37	H929638 H927637 H928637 H926636 H925643	26 June	series of small beaches 1-5m	Coarse sand	- trampled	-	-	26 [3]	One small area ungrazed
20. Ennismore House	H37	H938627 H939627	26 June	30	Fine sand. coarse sand	(+)	-	Plastic/ misc. rubbish/ algae	13 [4]	
21. Bann Far Waterfoot	H37	H958629	26 June	3-4	Humus, fine sand	- trampled	+	Algae	6 [2]	Severe algal problem.
22. Derrytagh North	H37	J003633	14 August	60	Fine sand, gravel	(+) vegetated	-	Algae	14 [4]	Humanly disturbed
23. The Jetty, Ardmore	H37	J005633 J006633 J007633	14 August	180	Fine sand	+ vegetated	-	Algae	28 [6]	Over grown.
24. Sand Plant, Ardmore	H37	J010633 J011633 J012633 J013633	14 August	400	Fine sand	+ vegetated, disturbed	-	Algae	22 [6]	Over grown.

APPENDIX II
SPECIES LISTS

LNFSB (site no.)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
SPECIES																									
Diplopoda																									
<i>Ommatoiulus sabulosus</i> (L.)	+	+																					+		
<i>Tachypodoiulus niger</i> (Leach)	+	+	+	+	+	+						+		+										+	+
<i>Cylindroiulus latestriatus</i> (Curtis)				+	+	+								+	+										
<i>Cylindroiulus brittanicus</i> (Verhoeff)																			+						
<i>Ophiulus pilosus</i> (Newport)				+	+	+																			
<i>Polydesmus angustus</i> Latzel																			+						
<i>Polydesmus inconstans</i> Latzel				+																					
Chilopoda																									
<i>Lithobius melanops</i> Newport																			+						
Arachnida																									
<i>Arctosa perita</i> (Latreille)						+	+						+	+	+										
Crustacea: Isopoda																									
<i>Porcellio scaber</i> Latreille			+																	+				+	
Dermaptera																									
<i>Forficula auricularia</i> L.			+	+																+				+	
Hemiptera																									
<i>Saldula saltatoria</i> (L.)	+	+		+		+		+	+	+	+	+		+				+	+	+	+	+			
<i>Scolopostethus affinis</i> (Schilling)													+						+						

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Coleoptera																								
Carabidae																								
<i>Pelophila borealis</i> (Paykull)	+					+					+	+							+					+
<i>Nebria brevicollis</i> (Fab.)												+							+					
<i>Elaphrus cupreus</i> Duft.																		+						
<i>Elaphrus riparius</i> (L.)	+		+	+	+	+		+	+		+		+	+		+	+	+	+	+	+	+		
<i>Clivina fossor</i> (L.)								+				+	+	+										
<i>Dyschirius obscurus</i> (Gyll.)	+	+		+		+	+	+	+	+	+		+										+	+
<i>Trechus quadristriatus</i> (Schrank)							+																	
<i>Trechus rubens</i> (Fab.)							+																	
<i>Bembidion aeneum</i> Germar				+	+	+		+				+	+											
<i>Bembidion bipunctatum</i> (L.)	+								+		+			+			+	+	+					
<i>Bembidion bruxellense</i> Wesmael												+												
<i>Bembidion guttula</i> (Fab.)	+	+	+	+		+	+	+											+	+				+
<i>Bembidion harpaloides</i> Serv.								+																
<i>Bembidion mannerheimi</i> Sahlb.		+																	+		+			
<i>Bembidion monticola</i> Sturm									+															
<i>Bembidion pallidipenne</i> (Ill.)	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+		+	+		+	+	+
<i>Bembidion punctulatum</i> Drapiez				+		+		+	+					+										
<i>Bembidion tetracolum</i> Say	+								+			+		+	+			+	+	+	+			
<i>Pterostichus nigrita</i> (Payk.)																			+	+			+	+
<i>Calathus piceus</i> (Marsh.)				+																				
<i>Laemostenus terricola</i> (Herbst)				+																				
<i>Agonum albipes</i> (Fab.)	+	+	+			+			+		+	+	+	+	+	+	+	+	+	+			+	+
<i>Agonum assimile</i> (Payk.)			+																					
<i>Agonum dorsale</i> (Pont.)													+											
<i>Agonum marginatum</i> (L.)			+			+		+			+	+	+	+	+			+	+					

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
<i>Agonum muelleri</i> (Herbst)							+																	
<i>Agonum obscurum</i> (Herbst)						+																		
<i>Agonum piceum</i> (L.)																	+							
<i>Agonum thoreyi</i> Dejean						+	+																	
<i>Amara aenea</i> (Degeer)						+																		
<i>Amara fulva</i> (Müller)		+												+									+	+
<i>Amara plebeja</i> (Gyll.)																					+			
<i>Harpalus affinis</i> (Schrank)			+																					
<i>Harpalus rufibarbis</i> (Fab.)							+							+										
<i>Harpalus rufipes</i> (Degeer)																					+			
Noteridae																								
<i>Noterus clavicornis</i> (Degeer)				+																				
Gyrinidae																								
<i>Orectochilus villosus</i> (Müller)											+			+										
Hydrophilidae																								
<i>Helophorus aequalis</i> Thoms.									+					+										
<i>Helophorus brevipalpis</i> Bedel	+				+	+		+		+												+		
<i>Helophorus minutus</i> Fab.				+																				
<i>Helophorus obscurus</i> Muls.				+						+														+
<i>Cercyon atomarius</i> (Fab.)					+																			
<i>Cercyon haemorrhoidalis</i> (Fab.)						+																		
<i>Cercyon marinus</i> Thoms.	+		+	+	+	+		+		+			+	+				+				+	+	
<i>Cercyon melanocephalus</i> (L.)									+															+
<i>Megasternum obscurum</i> (Marsh.)	+	+				+																+	+	+

<i>Anacaena globulus</i> (Payk.)									+															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
<i>Anacaena limbata</i> (Fab.)	+																							
<i>Laccobius biguttatus</i> Gerh.	+																							
<i>Enochrus testaceus</i> (Fab.)						+																		
Histeridae																								
<i>Saprinus aeneus</i> (Fab.)							+						+											
Silphidae																								
<i>Thanatophilus dispar</i> (Herbst)													+						+					
Staphylinidae																								
<i>Olophrum piceum</i> (Gyll.)							+																	
<i>Lesteva heeri</i> Fauvel									+															
<i>Lesteva longoelytrata</i> (Goeze)	+					+			+															
<i>Deleaster dichrous</i> (Grav.)				+		+	+	+	+		+	+	+	+					+					
<i>Bledius subterraneus</i> Erich.								+												+	+	+	+	+
<i>Carpelimus corticinus</i> (Grav.)				+				+					+					+						
<i>Thinodromus arcuatus</i> (Steph.)								+	+															
<i>Oxytelus sculptus</i> Grav.																								+
<i>Anotylus rugosus</i> (Fab.)		+		+	+	+		+	+	+		+		+										+
<i>Stenus boops</i> Ljungh	+			+		+		+				+	+					+						
<i>Stenus canaliculatus</i> Gyll.									+	+			+					+						
<i>Stenus cicindeloides</i> (Schall.)													+											
<i>Stenus clavicornis</i> (Scop.)						+																		
<i>Stenus crassus</i> Steph.	+	+				+	+	+	+	+	+	+	+	+				+	+	+		+	+	+
<i>Stenus juno</i> (Payk.)	+					+																		

Brentidae																									
<i>Ceratapion gibbirostre</i> (Gyll.)			+																						
Curculionidae																									
<i>Barypeithes pellucidus</i> (Bohem.)	+							+																	
<i>Barynotus moerens</i> (Fab.)				+																					
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	
<i>Hypera arator</i> (L.)									+																
<i>Phytobius quadrituberculatus</i> (Fab.)						+								+									+		

SUPPLEMENTARY REPORTS

Report Two: Lough Neagh Beach Survey - Re-Survey Of Key Sites, 1997

The survey of 1996 failed to locate any specimens of the two target species. In view of the possibility of overlooking small populations which may undergo large annual variations in numbers, a backup visit to some of the key sites was proposed for 1997.

Visits were restricted to the three largest beaches found in the previous survey (Anderson 1996) which held out the best possibility of re-finding colonies of the target species:

LNFSB 6: Moyola Far Waterfoot, north (H970902)	19 June 1997
LNFSB 14: Ballinderry Far Waterfoot (H954810)	19 June 1997
LNFSB 23: Jetty Beach, Ardmore (J005633)	24 June 1997

RESULTS

The visits listed took place in settled, warm, anticyclonic conditions. Thorough combing of the beaches again failed to provide evidence of the occurrence of the target species.

A total of 9 species of Coleoptera were added to the list for Moyola Far Waterfoot north and 12 to the list for Jetty Beach, Ardmore, but no additional species were seen at Ballinderry Far Waterfoot. Revised species lists with the additional species are given in Appendix I.

The only notable species in these supplementary lists (Appendix I) is *Carpelimus impressus* (Staphylinidae) from Moyola Far Waterfoot, recently added to the Irish List by Owen (1994) from a lakeshore in Co. Clare and probably rare and/or localised in Ireland.

Edaphic conditions at the beaches

Conditions at Moyola Far Waterfoot were changed from 1996 - considerable erosion of the beach had occurred leaving only 1-2m of steeply shelving coarse sand between the water margin and an eroded humus soil formerly well back from the waterline. Little suitable habitat for the specialist fine sand fauna was left in this area. Reasons for the erosion process were not apparent from this visit but seemed unlikely to be entirely due to storm damage. A change in the direction of inshore water movement is likely to have occurred. The only man-made disturbance in the local environment capable of producing this effect is the mainly offshore activity of sand dredgers and the construction of a crude breakwater at LNFSB 7, to the south, by a local riparian owner. Time did not permit further investigation of this phenomenon.

While conditions at Moyola Far Waterfoot (LNFSB 6) have deteriorated, other beaches in the vicinity have been little affected or possibly improved as far as sand quality and profile are concerned. Some movement of sand deposits east towards LNFSB 5 appears to have occurred between 1996 and 1997. This may be part of a longer term change which found particular expression in 1996/7. The result has been the almost complete removal of the beach on which *Stenus palposus* was formerly recorded (Anderson 1979).

Conditions at the other two beaches visited (Ballinderry Far Waterfoot and Jetty Beach, Ardmore) were similar to those observed previously.

Ancillary surveys

Opportunity was taken to look at beaches on the eastern shores of Lough Neagh not covered by the 1996 survey in case suitable conditions for either of the target species had been overlooked. The results are not reported in detail here, being outside the scope of the present re-survey, but indicate that only two other beaches were in any way suitable for the fine sand fauna (Bartin's Bay and Inner Lady Bay). However, neither possessed the full range of indicator species, *Bledius subterraneus* and *Dyschirius obscurus* in particular, being absent.

CONCLUSIONS

Interrim conclusions are that *Stenus palposus* and *Bembidion argenteolum* are now extinct on Lough Neagh.

The possibility of sandy river banks on the Moyola River still holding populations of *Stenus palposus* was investigated during the year, but results were again negative. The three large beach systems referred to above will be visited on a regular basis in future years to see if there is any change in their status. In the meantime, the investigation being complete and having drawn a negative conclusion, Biodiversity Action Plans for *Stenus palposus* and *Bembidion argenteolum* must go on hold to await further developments, if any.

Report Three: Survey of the species' distribution and environment on Lough Neagh, updated to 2004

1. Historical context

1.1 *Bembidion argenteolum* Ahrens

Bembidion argenteolum is widely but very locally distributed over northern Europe where it is restricted to fine sand habitats on the margins of freshwater. Within the British Isles there is a single recent record, for a coastal site in East Kent, relating to a putative immigrant or descendant of an immigrant (Hyman and Parsons 1992). Older records exist for native populations at several sites on Lough Neagh in Northern Ireland. These populations are clearly relict and isolated by a considerable distance of both land and sea from the nearest inhabited Continental stations.

The first confirmed record of this species on Lough Neagh is that of Johnson (1899) who reported the capture of several specimens (initially as *Bembidion paludosum* (Panz.) = *litorale* (Oliv.)) from Ardmore on the southern shoreline. There are older Lough Neagh records of "*Bembidion paludosum*" which undoubtedly refer to the same species i.e. Patterson (1838) for Shane's Castle on the north-east shore, Dawson (1854) for Lough Neagh, unlocalised and Haliday (1885) for "near Belfast" taken as meaning Lough Neagh. Johnson (1914) subsequently reported this species from Glenavy on the eastern shore of the Lough on the basis of records made the late H. L. Orr. Halbert (1910) refound the species at Shane's Castle and the most recent record is that of Janson (1924) for the same locality.

There are 3 W. F. Johnson specimens in the Ulster Museum (UM) labelled "Ardmore, L. Neagh" and dated 19 June 1899. There is a single specimen in the National Museum of Ireland (NMI) for the same locality and date and 2 labelled "Lough Neagh", dated 28 June 1902 and attributed to C.W. Buckle. A further 3 Johnson specimens in NMI are labelled Lough Neagh but without locality or date. Finally, 6 O.E. Janson specimens in NMI are labelled "Shane's Castle" and dated 20 June 1923. The latter are the most recent specimens known to have been collected on the Lough and their capture is recorded by Janson (1924). No doubt some of the material listed above also has its counterparts in British collections.

1.2 *Stenus palposus* Zetterstedt

This species was first reported by Johnson (1895) on the basis of specimens forwarded to him by H. L. Orr and said to have been collected somewhere between Toome and the mouth of the Ballinderry River in the north-west corner of the Lough. Both Halbert (1910) and Janson (1924) subsequently reported the species from beaches at Shane's Castle, but the Orr report was never further investigated. Apart from a curious and probably mistaken record by Nicholson (1910) for a reedbed at Balrath Co Meath, there

were no further reports until Anderson (1979) refound the species between Toome and the mouth of the Moyola River in the north-west of the Lough.

This colony occupied a beach of about 150m length in an area which had previously been exploited by sand extractors and has several water-filled sand-pits from very small to large (>5ha) size behind the shoreline. At the time of the discovery the beach was 5-10m in depth with a damp-sand shoreline of 1-4m depth and a drier sand deposits behind this of 3-8m depth. *Stenus palposus* was first encountered on 21 May 1977 in mid afternoon on a warm day on the damp sand area, 1-3m from the water's edge. Densities of up to 10 per m² were observed along the central 40-50m of beach. Total population size was not estimated but may have been 1-2000. Fine sand beaches on either side of this beach located at H970902 were visited on this and subsequent occasions but the species was not encountered. Total records for this beach are as follows:

21 May 1977: warm, bright sunshine; several hundred observed
20 May 1978: similar conditions; 20-30 observed
17 May 1980; similar conditions; 10-20 observed
19 June 1983; similar conditions; 2 only found

Subsequent visits to the site on 17 May 1985, 14 May 1996 and 1 June 1996 failed to produce further specimens of this species. Beaches at Shane's Castle have been visited on a number of occasions (Anderson 1979) but neither *Stenus palposus* nor *Bembidion argenteolum* have been encountered. Nor has either species been encountered at other sites on Lough Neagh.

2. Subsequent survey: scope and dates

1. Survey of fine sand beaches (LNFSB) on Lough Neagh, 1996:

This covered a total of 24 sites around the Lough perimeter. These were visited on the following dates:

1 June; 6 June; 14 June; 20 June; 26 June; 14 August 1996.

2. Re-survey of selected sites, 1997

Following the 1996 survey in which all fine sand beaches locatable on Lough Neagh were surveyed, only areas of the shoreline with a recent history of occurrence of *Stenus palposus* were visited during the period i.e. the Far Waterfoot area between Creagh Point and the estuary of the Moyola River, Co Londonderry, last known site for *Stenus palposus*.

Site re-survey was conducted on:

19 June 1997.

3. Visits, 1998-2002

Brief visits to LNFSB 6: Moyola Far Waterfoot, were undertaken, but with no sign of the *Stenus palposus* colony which formerly existed there:

9 May 1998; 26 May 2002

4. Re-survey of two sites, 2004

Re-survey was undertaken in 2004 to both LNFSB 6: Moyola Far Waterfoot and to LNFSB 25: Shane's Castle Beach. The latter had not been visited recently and since *Stenus palposus* occurred there in 1923 (Janson 1924), it was considered essential to eliminate the possibility of a residual colony being present. Site visits were made as follows:

LNFSB 6: Moyola Far Waterfoot, north (H970902) *22 May 2004, 12 June 2004*

LNFSB 27: Shane's Castle Beach (J122878) *16 May 2004, 12 June 2004*

As on previous occasions, nothing was found.

Sufficient time has now elapsed to allow the conclusion that both Action Plan species are extinct at these sites and very probably in the Lough Neagh basin.

Report Four: Report on *Stenus palposus* and *Bembidion argenteolum* Action Plans, 1997-2002

Summary:

Only areas of the Lough Neagh shoreline with a recent history of occurrence of these insects was visited during the period i.e. the Far Waterfoot area between Creagh Point and the estuary of the Moyola River, Co Londonderry, last known site for *Stenus palposus*.

These were visited on 19 June 1997, 9 May 1998 and 26 May 2002.

No evidence was found for the continued occurrence of *Stenus palposus* in this area. Certain structural changes to the habitat in which this species was found, were noted and are detailed below. Sand deposits in the area are continuously changing but changes noted in the six-year period of the report are regarded as deleterious overall.

Structural changes to the Far Waterfoot shoreline habitats

Since 1983, the last year of occurrence of *Stenus palposus* in this area, the extent and quality of the sand deposits in the beach where the population occurred (H970902) have declined drastically.

In the 1980s and early 1990s there was a significant shift in direction of storm fronts in the area from west-northwest to southerly. This led to significant erosion of the shoreline which can be seen today in the retreat of alder *Alnus glutinosa* stands bordering the south of the study beach, and piling of sand deposits well inside the formerly stable margins of the stands. Retreat of the physical shoreline has only been about 2m but the sand deposit front has advanced 5-6m in that time.

Corresponding damage to the formerly stable and wide, open sand deposits on the beach, has occurred. By 1998 the beach, which in 1977 was 10-15m deep had disappeared and erosion was claiming grassy swards at the former back of the beach. Between 1998 and 2002 the beach had re-formed to a small extent and varied in depth from 0m to 2-3m.

The effect of these changes upon stenotopic beach fauna was noted. Species considered good indicators of the fine sand habitat include *Bembidion pallidipenne*, *Dyschirius obscurus* (Carabidae), *Bledius subterraneus*, *B. fuscipes*, *Stenus crassus*, *S. melanopus* (Staphylinidae) and *Anthicus scoticus* (Anthicidae).

All are still present on the beach except for *Bledius annae* which has not been seen since 1977, so the majority are clearly able to accommodate the changes listed. An important aspect of this is the availability of extensive fine

sand beaches to the north of the study area up to Creagh Spit (H981903). These must act as refugia when conditions are unfavourable further south. In this context it is important to note that these historically more disturbed beaches are themselves still under threat from extensive sand working operations at McCann's and Scott's (Toomebridge).

The absolute numbers of the indicator species at H970902 has clearly changed during the period 1997-2002 due to increasing erosion. Apart from the disappearance of *Bledius annae*, *Bledius subterraneus* has become rarer, although this does not seem to have impacted significantly upon the relative abundance of its main predator *Dyschirius obscurus*. All species are now reduced in numbers due to disappearance of habitat but still well distributed in the remaining areas apart from the examples cited. It remains to be seen whether the habitat is sustainable in the longer term as the change in storm front direction has partially reversed in recent years but re-establishment of the beach is only very partial.

This raises the question of whether wind direction is the only factor affecting beach establishment. Extensive sand dredging operations occur constantly offshore. It is highly likely that these have contributed to beach erosion. The extent of this contribution is impossible to estimate and will be settled only by a survey of deposits offshore, and the effects of dredging upon these.

Appendix. Additions to site faunal lists, 1997-2002

Species/group	19 June '97	9 May '98	26 May '02
Mollusca			
<i>Valvata piscinalis</i>			+
<i>Planorbarius corneus</i>			+
<i>Planorbis planorbis</i>			+
<i>Bathyomphalus contortus</i>			+
<i>Anisus leucostoma</i>			+
<i>Radix peregra</i>			+
<i>Succinea putris</i>			+
<i>Oxyloma elegans</i>			+
Coleoptera			
Carabidae			
<i>Bembidion femoratum</i>			+
Staphylinidae			
<i>Oxytaelus laquaetus</i>	+		
<i>Carpelimus impressus</i>	+		
<i>Omalium rivulare</i>		+	
<i>Philonthus marginatus</i>		+	
<i>Sepedophilus marshami</i>		+	
<i>Sepedophilus nigripennis</i>		+	
<i>Aloconota cambrica</i>	+		
<i>Atheta atricolor</i>		+	
<i>Atheta debilis</i>	+		
<i>Zyras collaris</i>			
Halipilidae			
<i>Halipilus immaculatus</i>	+		

Dytiscidae*Hydroporus pubescens*

+

Hydrophilidae*Cercyon analis*

+

Scirtidae*Cyphon ochraceus*

+

Cryptophagidae*Micrambe vini*

+

Micrambe bimaculata

+ [pRDBK]

Chrysomelidae*Gastrophysa polygona*

+

Longitarsus melanocephalus

+

Longitarsus suturalis

+

Bruchidae*Bruchidius villosus*

+

Curculionidae*Phloeophthorus rhododactylus*

+

Hylastinus obscurus

+



Our aim is to protect and conserve the natural and built environment and to promote its appreciation for the benefit of present and future generations.

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