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Spence Learning Resource Centre



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The distribution of intertidal *Zostera* spp. in Northern Ireland 2003

Prepared for
Environment & Heritage Service

by

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Executive Summary

1. Seagrasses play an important functional role in coastal ecosystems. They are, however, susceptible to changes in abundance and distribution due both to natural and anthropogenic influences. Seagrass beds of the genus *Zostera* are a component of the Annex I habitat "Large shallow inlets and bays, Estuaries and Mudflats not covered by the tide at low water" of the EC Habitats Directive 1992 and they are a priority habitat of the Northern Ireland Biodiversity Strategy.
2. The aims of this project were to produce an up to date record of the distribution and abundance of *Zostera* spp.; to establish a baseline for future monitoring; to determine the degree of statutory protection of beds and to assess the condition of and threats to seagrass beds. Recommendations for future monitoring and an assessment of historical changes in the distribution are also made.
3. The distribution of intertidal *Zostera* spp. was investigated in the major estuarine areas of Northern Ireland. The limits of beds were mapped using DGPS and details of species composition, coverage, biomass and fixed point photography were recorded along fixed transects. All data were stored on a Geographical Information System (GIS). Survey work was carried out from July to October 2003. Detailed maps and descriptions of beds, positions and details of transects and photographs are presented in this report, appendices and complete details are provided in electronic format.
4. Seagrass beds were found to cover some 1156 ha of intertidal mudflats in Northern Ireland's estuaries. Of this total area, 80% was found in Strangford Lough and a further 18% in Lough Foyle. Though other estuaries contained only a small proportion of the overall resource they should be considered to be of significant conservation value. Three species of *Zostera* occur in Northern Ireland, *Z. marina*, *Z. marina* var. *angustifolia* and *Z. noltii* (though there are questions of the genetic identity of *Z. marina* var. *angustifolia*). *Zostera noltii* was the most widespread and was found in all estuaries containing *Zostera* spp.. Belfast Lough was the only major estuary not found to have any *Zostera* spp. present.
5. All surveyed beds had some form of legal protection in the form of ASSI, SPA, cSAC or MNR designations. A wide range of threats were identified ranging from direct impact of vehicular traffic, eutrophication, smothering by *Enteromorpha* spp. and competition from invasive species, *Spartina* spp..

6. From the available historical information, it is clear that the distribution of *Zostera* spp. is restricted compared to the past. Species composition has also changed; *Zostera marina* was the dominant species in the intertidal in the mid 1930s whereas *Zostera noltii* is currently the most common species. The apparent constriction in distribution is likely to have taken place in all estuaries, though it is also clear that the status of *Zostera* spp. is dynamic with frequent contemporary changes in species composition, abundance and distribution.
7. Recommendations for conservation, monitoring and research are made that would provide the Environment and Heritage Service with measures for conservation and restoration of seagrasses in Northern Ireland.

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Introduction

As scientific knowledge of seagrasses has improved it has become clear that they have an important functional role in coastal ecosystems and are an increasingly vulnerable resource (Hemminga & Duarte, 2000). Seagrasses enhance biodiversity and perform a number of important ecological functions, for example:

- Provision of nursery and foraging areas for commercially exploited fish,
- Improvement of water quality by reducing particle loads and removing dissolved nutrients
- Stabilization of sediments
- Provision of a valuable food resource for herbivores
- Have a significant role in the global carbon cycle

They are vulnerable to natural events in the coastal environment but have increasingly been impacted upon by anthropogenic influences including land reclamation, eutrophication, physical damage (i.e. moorings and trawling damage) and competition with invasive species (e.g. *Spartina* spp.).

In recognition of the role seagrasses play in our coastal environment seagrass beds of the genus *Zostera* were identified as an important component of the Annex I habitat "Large shallow inlets and bays, Estuaries and Mudflats not covered by the tide at low water" of the EC Habitats Directive 1992.

Within Northern Ireland, seagrass beds are a priority habitat of the Northern Ireland Biodiversity Strategy and *Zostera angustifolia*, *Zostera marina* and *Zostera noltii* are also listed as species of conservation concern in Northern Ireland (Anon, 2000). Seagrass beds are also the subject of a published Habitat Action Plan for Northern Ireland (Anon, 2003).

An overview of the genus *Zostera* in the UK is given by Davison (1997). Studies on the distribution and abundance of *Zostera* spp. along the coastline of Northern Ireland have been carried out, but have tended to be localised with no overall systematic methodology (Lynn, 1936; Bleakley, 1971; Corbett, 1980 and Portig, 1997). To date, there has been no overall survey of the distribution of *Zostera* in Northern Ireland.

This project was designed to address the following objectives.

1. To produce an up-to-date record of the distribution and abundance of *Zostera* spp. in Northern Ireland as a baseline against which future changes could be monitored.
2. To determine the degree of statutory protection status given to sites within the current range of *Zostera* spp.
3. To assess of the status, condition and threats to *Zostera* beds at each site.
4. To recommend strategies, including methodology, for the future monitoring of *Zostera* spp. at each site.
5. To assess historical change in the distribution of *Zostera* spp. where possible.

These objectives address a number of targets identified in the Northern Ireland Habitat Action Plan – Seagrass Beds, either by completing requirements for data or by providing information for fulfilling management aims. Specifically these include the following actions:

- 4.1 – Maintain the extent of seagrass beds in Northern Ireland waters.
- 4.2 – Maintain the quality of seagrass beds in Northern Ireland.
- 4.3 – Maintain the distribution of seagrass beds in Northern Ireland.
- 5.2.1 – Carry out and publish an up to date record of the extent, quality and distribution of seagrasses in N.I.
- 5.2.2 – Identify beds that are damaged or degraded.
- 5.2.4 – Determine the extent and quality of the seagrass resource which falls within protected areas and notify further sites, if required, to fill in significant gaps. In particular, ensure that there is adequate representation of the full range of variation in seagrass communities found around NI.
- 5.5.2 – Carry out research into the “natural” variability of seagrasses in space and time so that monitoring parameters / standards can be set.
- 5.5.3 – Carry out research into the historical variation in extent and distribution of seagrass beds in Northern Ireland.
- 5.5.5 – Establish a network of seagrass monitoring stations around N. Ireland

The project has also facilitated research under the following action by collection of relevant material.

- 5.5.7 – Investigate the genetic diversity of *Zostera* spp. in Northern Ireland.

Methods

Taxonomy

There is some confusion concerning the systematics of *Zostera* spp. Conventionally, in the UK, three species have been recognised, namely *Zostera marina*, *Z. angustifolia* and *Z. noltii*. Although it is clear that the latter is a separate species, there is disagreement whether *Z. marina* and *Z. angustifolia* are different species or ecotypes. Outside the UK *Z. angustifolia* has been considered to be an annual form of the otherwise perennial *Z. marina* (Den Hartog, 1972). For the purposes of clarity, in this report the intertidal annual form is called *Z. marina* var. *angustifolia* and the perennial form is called *Z. marina*. *Ruppia* spp., though not technically seagrasses as they are considered more a brackish-water species rather than marine, are included in the survey as they can often occur in similar areas to *Zostera*.

Distribution

The following coastal areas of Northern Ireland were investigated: Strangford Lough, Lough Foyle, Carlingford Lough, Dundrum Bay, Killough Harbour, Larne Lough (part), Belfast Lough (part) (Figure 1). The Bann Estuary was not surveyed. Areas surveyed came from past experience of sites with previous knowledge, discussion with local experts e.g. Lough Foyle, Matthew Tinkner RSPB) and / or inspection of available aerial photography for likely areas of *Zostera* spp..

Surveys were carried out chiefly during August and September 2003 when *Zostera* beds are at their peak, before being grazed by wildfowl or dying back in the autumn.

The survey methodology was designed to fulfil a number of criteria:

- Allows the overall *Zostera* resource to be assessed
- Provides a baseline for which future changes in distribution of *Zostera* spp. can be measured
- The more detailed survey work allows more subtle changes in distribution and abundance and species distribution to be documented.

The outer limits of all beds were mapped to an accuracy of <1m using differential Global Positioning System (DGPS; Trimble Pro XR). The precise delineation of *Zostera* beds can be problematic in that the edge of a bed may or may not be distinct. In some cases, the bed is well defined and the edge can easily be mapped, whereas in other areas it is not distinct. While, beds generally had a reasonably distinct edge, there was some subjectivity in determining the limit of *Zostera* growth. Also when

mapping beds, it should be noted that the bed may not be continuous, but may be comprised of a fragmented series of patches or as a mosaic of habitats for which detailed, individual mapping would be unrealistic. This was addressed by the use of descriptions / photographs although the distribution was considered to be across an area as a whole. While every effort was made to find all beds of *Zostera* spp., it is unrealistic to expect that all patches were found but all major beds were recorded. Small patches and individual plants that are isolated will inevitably be missed.

During the course of the survey any damage to beds or potential threats to beds were recorded.

All distribution maps were overlaid with existing ASSI, SPA, SAC and MNR boundaries to determine the current conservation status of *Zostera* beds i.e. whether a significant proportion and / or representative examples of these important habitats are offered statutory protection.

Fixed transects were established across the *Zostera* beds and sample points were taken at fixed intervals. The sampling interval was 25, 50 or 100m depending on the size and variability of the bed. At each sample point the following variables were recorded: species present, coverage on a 10-point interval scale (0% absent – 100% total cover). Measured in this way, coverage is somewhat subjective due to variation in species composition, time of year and observer bias which means comparison of this variable between sites should be approached with caution. It is recommended that these figures are not used as an absolute value for comparison among beds but rather as a comparison of changes in cover within beds over time. Two photographs were also taken; one at a height of 1m directly of the surface and a second oblique photograph at right angles to the transect to cover as wide an area of the bed as possible to show the general area of the sample point.

The biomass of *Zostera* spp. was estimated at a sub-sample of the points along the transect. Three samples were collected, each consisting of a 20cm diameter core dug out to a minimum of 10cm. These were sieved *in situ* to remove sediment, using a 2mm sieve, bagged and frozen for subsequent analysis. In the laboratory, each sample was thawed, sub sampled if necessary and plants were separated into above- and below-ground fractions. It was not feasible to separate species. Fractions were dried separately in an oven at 70°C for 48hrs and their dry weight measured to 0.01 g. In addition to biomass sampling, 5 samples of each species (where present) were collected from the locality for genetic analysis. This material

was frozen for subsequent investigation into the genetic diversity of *Zostera* spp. in Northern Ireland.

The location of each sampling point was recorded using the DGPS. Each sample point was given a unique ID code and all photographs and samples coded accordingly. All distributions and sample points were stored on a GIS.

Results

The distribution of seagrass beds in each of the estuaries is presented in the following pages. Strangford Lough is divided into a number of sub-sites and other estuaries are treated individually or as appropriate depending on area. These take the same format and order:

1. Site description, including location and physical characteristics
2. Bed descriptions, including status, species and threats.
3. Map of the beds and sampling transects.
4. Sample photographs of beds and threats

Data on coverage, species composition, biomass, photographs and labels and details of transect codes are appended to this report and supplied in full detail electronically.

Recommendations for monitoring and future work are made separately at the end.

This project was due to start in June 2003 but due to unforeseen circumstances, project work was not started until late July 2003. As a result it was not possible to survey all areas as by late autumn when *Zostera* spp. are being grazed by wildfowl and natural dieback occurs.

Northern Ireland - Overview

Three species of *Zostera* occur in Northern Ireland's estuaries, *Zostera marina*, *Z. marina* var. *angustifolia* and *Zostera noltii*. *Zostera noltii* was the most widespread occurring in all estuaries containing *Zostera* spp.. *Zostera marina* was only found in Strangford Lough and Carlingford Lough. In the intertidal only two small beds were found in Strangford Lough. Evidence of the subtidal presence of *Zostera marina* was found in Carlingford Lough from drift material. The only major estuary that had no *Zostera* was Belfast Lough, though Killough Harbour has only a tiny bed of *Zostera noltii* remaining.

Zostera spp. covered some 1156 ha of intertidal mudflats in Northern Ireland's estuaries (Table 1). Although the survey did not achieve complete coverage, it is unlikely that un-surveyed areas would add significantly to this figure. The most recent estimates for Ireland as a whole based on early 1990s research (Natura Consultants, 2003) estimates an area of intertidal *Zostera* spp. of 1588 hectares for the whole of Ireland so Northern Ireland represents a significant resource in Ireland as a whole. Within Northern Ireland, Strangford Lough contained the majority of the *Zostera* resource (80%). Though other populations are considered important for their conservation value e.g. for their potential genetic diversity.

All *Zostera* beds that were mapped in Northern Ireland have some form of legal protection, in that they lie within an existing ASSI, SPA, SAC or a MNR (Table 2).

A wide range of threats to *Zostera* spp. were identified. Eutrophication was widespread, mostly demonstrated by smothering with *Enteromorpha* spp., though there are likely to be other indirect effects from this process. *Spartina* was considered to be a threat in many areas from competition for space. Direct damage was observed in many areas from activities that disturbed the sediments ranging from bait digging to vehicular activity.

Table 1: Summary of *Zostera* distribution and biomass in Northern Ireland 2003.

Site	Subsite	Area (ha)	Mean Biomass (g/m ² dry weight) (S.E.)	Mean % Cover (S.E.)	Za	Zm	Zn	Ruppia
Strangford Lough	Northend	512	70 (10)	47 (2)	☑	☒	☑	☑
	Chapel	}121	77 (14)	61 (3)	☑	☒	☑	☒
	Gasworks		111 (13)	58 (6)	☑	☒	☑	☒
	Castle Espie	113	90 (19)	66 (3)	☑	☒	☑	☑
	Greyabbey	82	69 (5)	47 (3)	☑	☒	☑	☒
	Seabank	3	86	50 (14)	☒	☒	☑	☒
	C.E. Pier-Paddies Pt	66	97 (14)	59 (4)	☑	☒	☑	☒
	Cunningburn	12	81	35 (6)	☑	☒	☑	☒
	Ringneill Bay	8			☑	☒	☑	☒
	Chambers	6			☑	☒	☑	☒
	Cross Island	1			☒	☒	☑	☒
	Black Neb	0.02			☒	☒	☒	☒
	Kircubbin Bay	0.004			☒	☒	☒	☒
	Total	924	85	53	☑	☑	☑	☑
Lough Foyle		211	96 (18)	54 (18)	☑	☒	☑	☒
Carlingford		8	120 (Na)	53 (Na)	☒	☒	☑	☒
Killough		<<0.1			☒	☒	☑	☒
Dundrum		13	20 (4)	41 (4)	☑	☒	☑	☑
Larne		~10			☑?	☒	☑?	☒
Belfast Lough					☒	☒	☒	☒
Northern Ireland Total	1156	80	52		☑	☑	☑	☑

Za = *Zostera marina* var. *angustifolia*
 Zm = *Zostera marina*
 Zn = *Zostera noltii*
 Ruppia = *Ruppia* spp.
 ☑ = Present
 ☒ = Not found
 <<10 = Less than 10% cover

Figure 1. Map of Northern Ireland showing sites surveyed in the Northern Ireland *Zostera* Survey 2003.

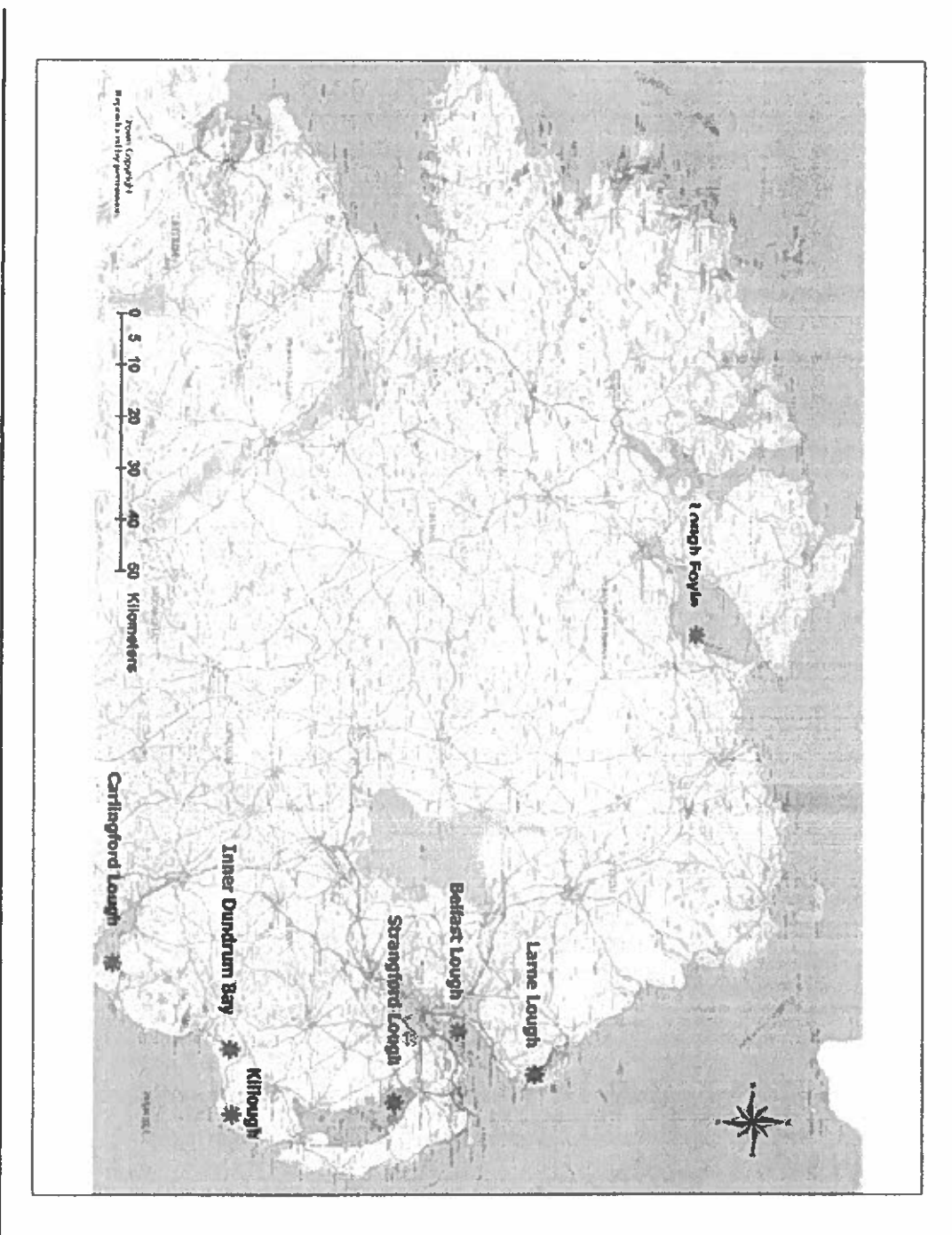


Table 2. Statutory protection given to sites containing *Zostera* beds

Site	ASSI	cSAC	SPA	MNR
Strangford Lough	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Lough Foyle	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Carlingford Lough	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	
Killough Harbour	<input checked="" type="checkbox"/>			
Dundrum	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Larne Lough	<input checked="" type="checkbox"/>		<input checked="" type="checkbox"/>	

Site Results

Strangford Lough.

Site Description: Strangford Lough is a large marine inlet on the east coast of Co. Down, N. Ireland (Figure 2), covering approximately 150 km² and is some 24 km long and 8 km wide at its broadest part (Brown, 1990). It is virtually land locked being connected to the Irish sea by a narrow channel, some 8 km long, through which strong currents of up to 7 knots flow. The Lough has a semi-diurnal tidal regime with tidal range varying from 3.5m (spring) to 2.0m (neaps). Extensive mudflats occur where the shore is protected from currents and the prevailing westerly winds and, therefore, predominate on the northern and western shores. There are extensive mudflats on the eastern shore, however, where shelter is afforded by the lee of Chapel Island.

Survey Coverage - Strangford Lough

Strangford Lough was extensively surveyed. All major beds north of a line from Mahee Island to Greyabbey were surveyed.

Un-surveyed areas: (See ?? in Figure 2:) South of Ogilvie Island (Grid Ref:J506689) It was not possible to survey this area due to problems of access and time constraints. This area from previous observations is known to have some relatively small resources of *Zostera noltii*, though *Z. marina* var. *angustifolia* may well be present.

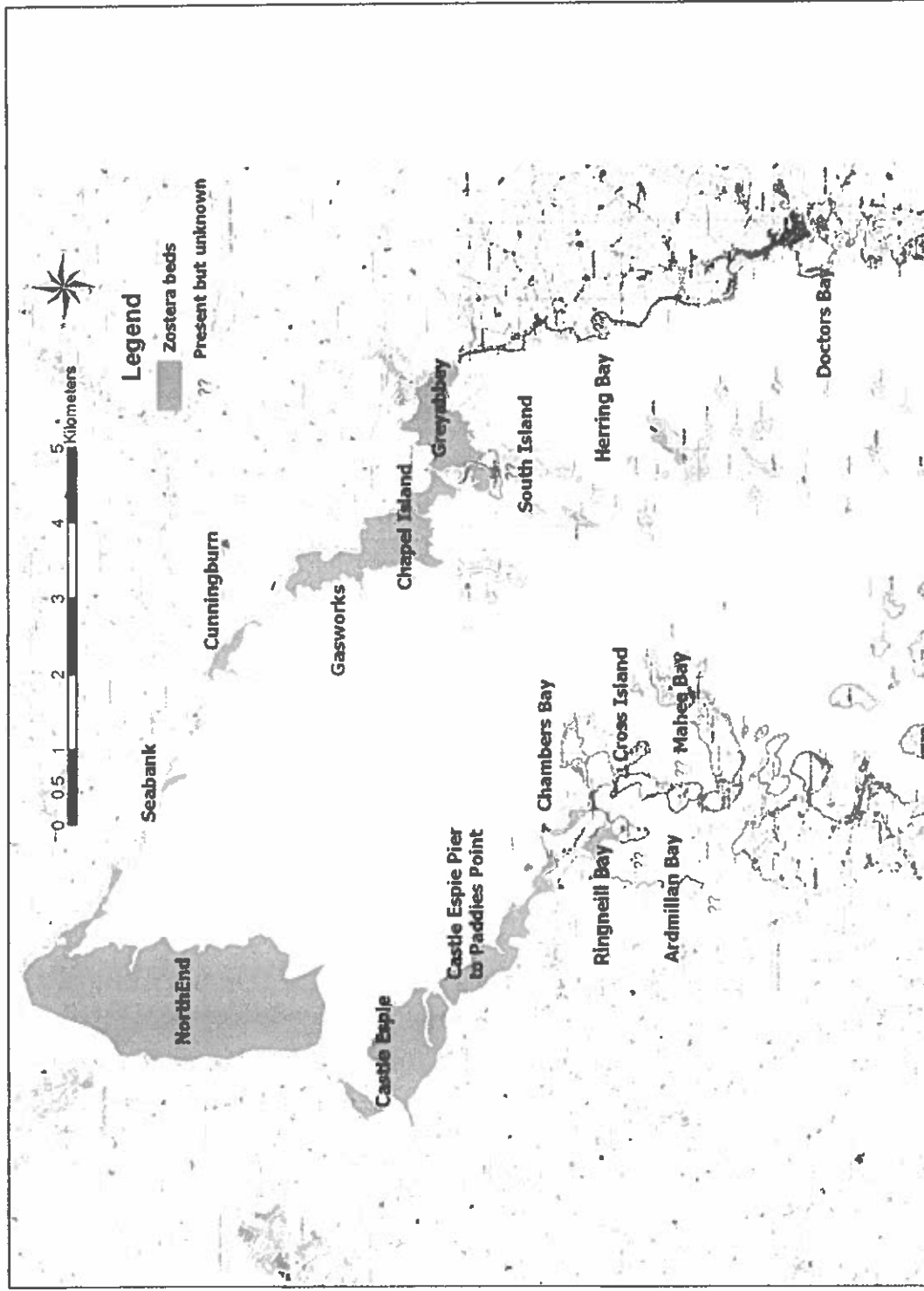
Mahee Bay (Grid Ref:J533644) and Ardmillan Bay (Grid Ref:J515642). Soft sediments made access on foot impossible and large amounts of *Enteromorpha* spp. present make mapping from aerial photography prone to large error. Both *Zostera noltii* and *Z. marina* var. *angustifolia* are known to occur in these bays.

East coast south of Kircubbin (Grid Ref:J596628). The series of small bays to the south of Kircubbin to Gransha Point (Grid Ref:J585594). It is known that *Zostera noltii* occurs in small amounts in these bays.

South Island – To the south of South Island (Grid Ref: J566666) a mixed bed of *Zostera* and mussels exists on the south shore of South Island.

It was not possible to map all these due to time constraints, though past observations suggest that these are not extensive and would be a minor component of the overall resource on Strangford Lough.

Figure 2: Map of Strangford Lough showing surveyed sites in the Northern Ireland *Zostera* survey 2003.



Overview of Strangford Lough

Strangford Lough has extensive intertidal *Zostera* beds covering some 924 ha (Figure 2), constituting 80% of the *Zostera* beds found in Northern Ireland. All three species are present in the intertidal, though the perennial form of *Zostera marina* was very rare in the intertidal and covered < 0.024 ha. All the beds are contained within the boundaries of the Lough's ASSI, SPA, cSAC and MNR designations. The distributions of *Zostera* spp. are generally limited to the upper levels of the shore with the occasional exception, e.g. Chambers Bay. On Strangford Lough *Zostera* occurs over a wide range of sediment types, occurring as mono-specific beds of *Zostera noltii* (Plate 5) and mixed beds of *Z. marina* var. *angustifolia* and *Zostera noltii* (Plate 1). In many areas, *Zostera* does not occur by itself but in mosaics of *Zostera* and other species of plant or animal such as furoid algae or mussels (Plates 4, 15 & 19).

***Ruppia* spp. – Strangford Lough** *Ruppia* was observed along two transects during the survey. Castle Espie Bed C 050 – 2 or 3 plants alongside transect at this point. North End XF40 – small patch present. In addition *Ruppia* was observed on the south side of Gransha Point during another survey.

***Zostera marina* – Strangford Lough** *Zostera marina* was found in the intertidal at two sites Kircubbin and Black Neb and have separate survey sheets at the end of the Strangford section. Subtidal *Zostera marina* occurs in Strangford Lough. Four significant beds occur on Strangford Lough, these are at Pig Island (J540700), Castleward (J582505), Ballyhenry Bay (J583517) and Kircubbin (J586662). It was outside the remit of this survey to map these beds though in conjunction with the Strangford Lough Ecological Change Investigation being undertaken by QUB and DARD, a trial was carried out on the suitability of using ROXANNE techniques in shallow water to map subtidal *Zostera marina*. This is reported separately.

Site: - Strangford Lough**Sub Site:** - North End**Grid Reference:** J497710**Survey Dates:** 5/08/2003, 6/08/2003, 7/08/2003 & 11/08/2003

Site Description: - This area consists of an extensive area of sandflats at the north end of Strangford Lough. These sandflats are much more extensive on the western shore than the eastern shore. The area has a high level of anthropogenic disturbance with extensive seawalls and a major sewage works serving the town of Newtownards. Other natural features consist of extensive mussel beds and a stream running in from the north eastern corner.

Bed Description: - There is considerable variation in species composition and abundance of *Zostera* over the area, which can be described as 3 major areas. On the western shore from north of the Butterlump Stone to the east of the river is dominated by *Zostera noltii* and is relatively free-draining and *Z. marina var. angustifolia* is present but scarce. The lower edge of the bed has numerous small patches of *Zostera noltii*. The majority of the area on the western shore from the northern end south towards the sewage works is dominated by a mixture of *Zostera noltii* and *Z. marina var. angustifolia* (Plate 1). This area is not free draining, large areas have permanent standing water or where water is retained for a considerable period after the tide has receded. Where water does flow off the sandflats, channels devoid of *Zostera* are formed. *Zostera* occurs right up the shore; *Zostera noltii* is dominant on the upper levels with a mixture of the two species below. Towards the lower limit of the bed *Zostera noltii* becomes absent with *Z. marina var. angustifolia* becoming gradually more sparse. As with the eastern shore at its lower limit the coverage of *Zostera noltii* becomes patchy. The area to the south of this from just north of the sewage works to Island Hill is different and itself may be split into two. The upper shore bounded to the east by the outfall channel is an area of variable density of *Zostera noltii* and *Z. marina var. angustifolia* with large amounts of *Enteromorpha* spp. also present (Plate 2). The area to the east of the sewage outfall and bounded to the east by a mussel bed is typical of the rest of the area in its upper reaches. Lower on the shore, which has much standing water and is dominated by *Z. marina var. angustifolia* with a heavy epiphytic growth of brown algae.

The area to the south of Island Hill specifically to the south of Ogilvie Island and Black Rock was not extensively surveyed. There are some areas of *Zostera* present though these are not believed to be extensive. Access to this area is restricted due to tidal constraints and potentially unsafe areas of sediment. Five transects taken D, H, M, XC and XF (Appendices 1a–f).

Threats: - *Spartina* is present at this site and is especially prevalent along the western shore. Though no continuous meadows exist at present there is potentially the capacity for much of the upper beds to be affected by its spread. *Enteromorpha* spp. are particularly abundant in the southern end of this site and are associated with the outfall of the sewage works. These are a potential threat to beds due to “smothering” of *Zostera*.

Figure 3: Distribution of *Zostera* beds and transect positions, North End – Strangford Lough.

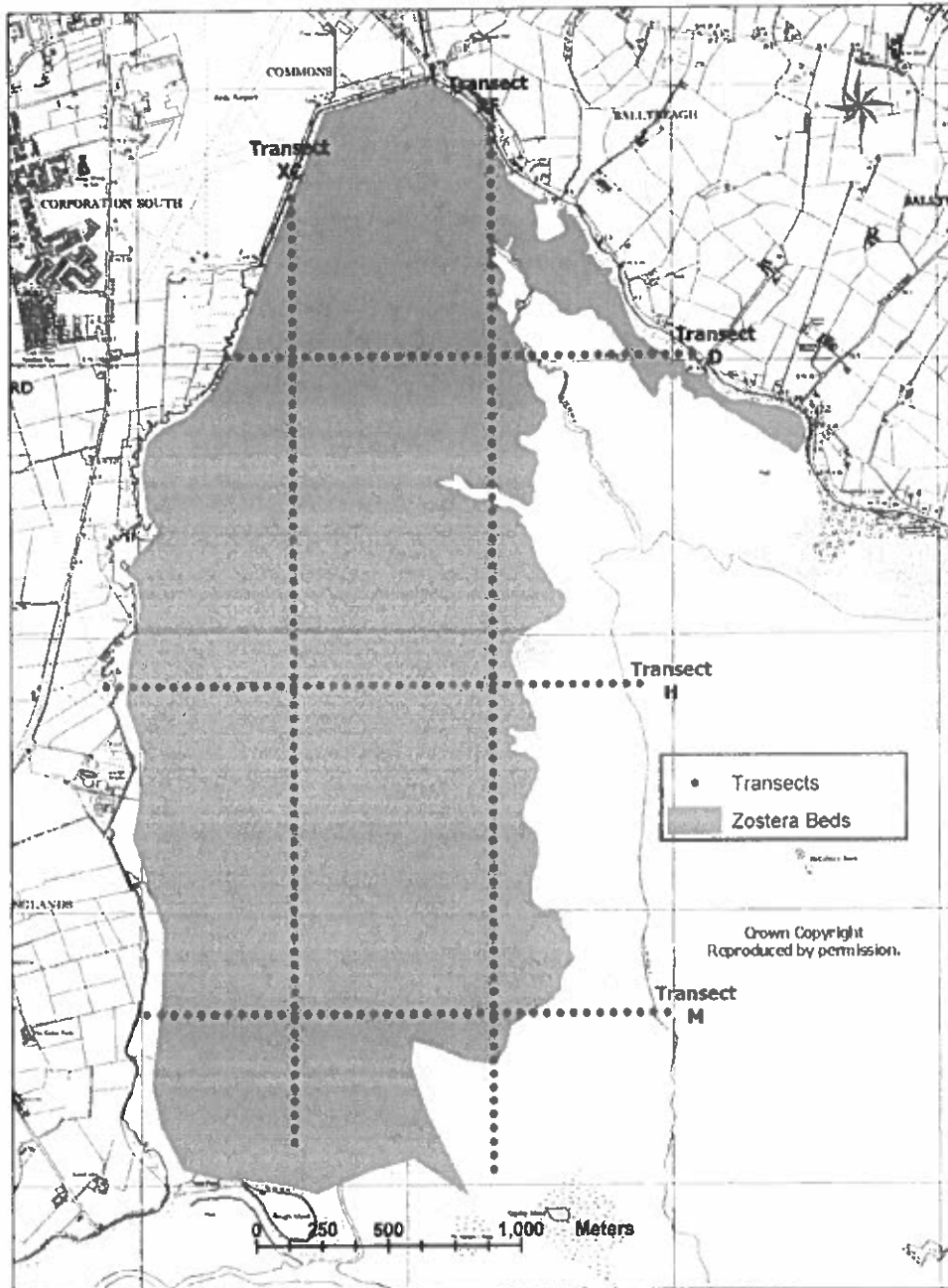




Plate 1: Mixed bed of *Zostera noltii* and *Z. marina* var. *angustifolia*, North End, Strangford Lough. (XC0462003WA.JPG).



Plate 2: Mixed bed of *Zostera* and *Enteromorpha* spp, North End, Strangford Lough. (M022003WA.JPG)

Site: - Strangford Lough**Sub Site: - Chapel****Grid Reference:** J560680**Survey Dates:** 21/08/2003

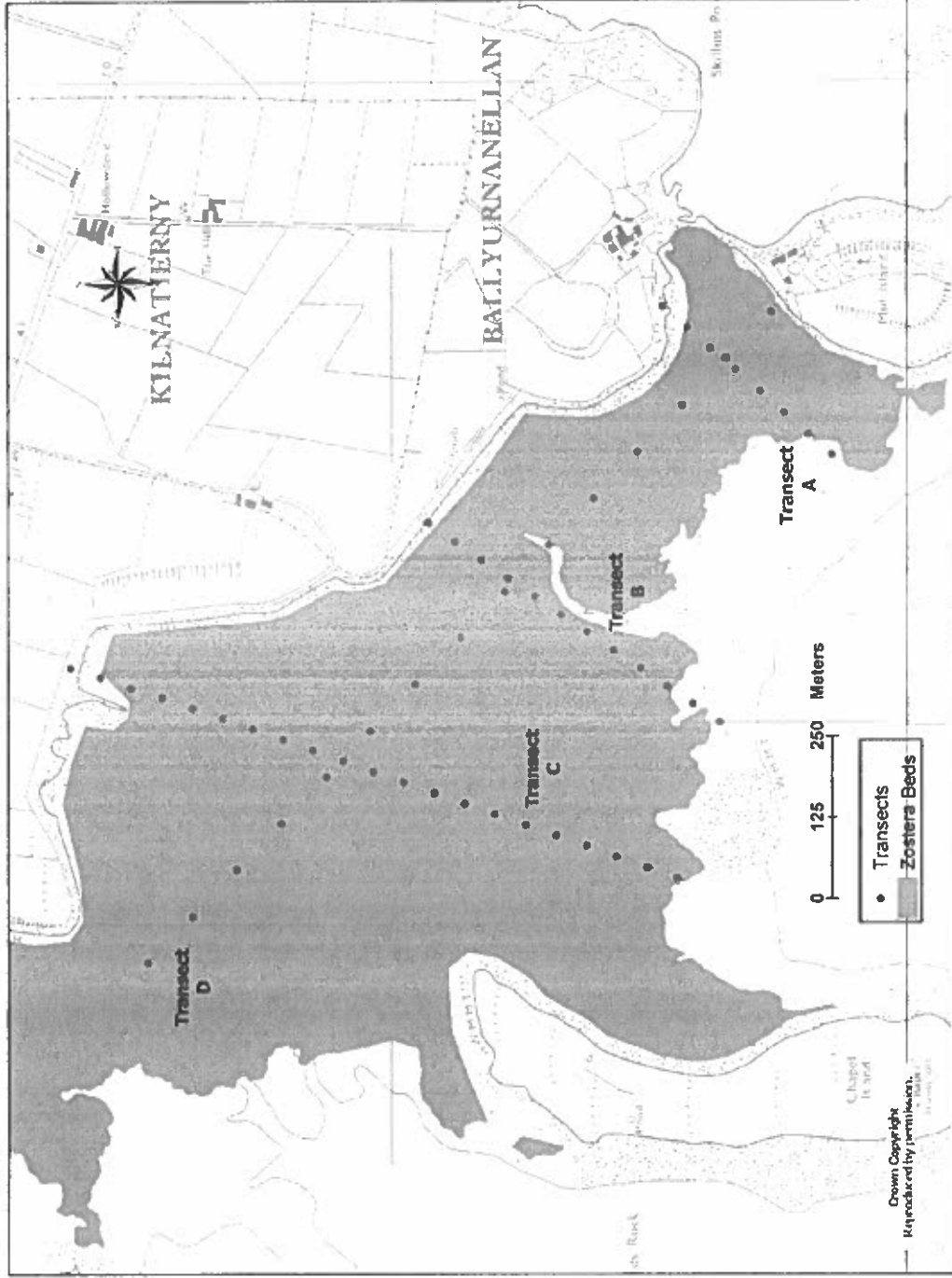
Site Description: - Chapel is a relatively sheltered bay on the east coast of Strangford Lough, protected to the west by Chapel Island and bounded to the south by Mid Island. Much of the foreshore consists of a seawall protecting reclaimed agricultural land. This site is extended to the north by the Gasworks site.

Bed Description: - Chapel Bay has an extensive area of *Zostera* running around the upper part of the Bay and around the shore either side towards Chapel Island itself and to the south around Mid Island. There is no distinct separation between the bed in this area and the Gasworks site. To the south *Zostera noltii* is the more abundant species with *Z. marina var. angustifolia* more common to the northern end. Though the beds are largely contiguous there are several areas where *Zostera* would not be considered to be the dominant species but is co-dominant; one is an area of mixed *Zostera* spp. and mussels and an area to the north (shared with the Gasworks) where there is also significant cover of *Fucus vesiculosus* attached to scattered mussels (Plate 4).

Four transects taken A, B, C and D (Appendices 2a–e).

Threats: - Some tractor tracks are visible as the bay is used as an access to Chapel Island. The status of the mussel *Fucus* and *Zostera* mosaic is unknown. It is not possible to judge whether this was in balance or changing in a particular direction, though it is likely that this is a dynamic mosaic.

Figure 4: Distribution of *Zostera* beds and transect positions Chapel Island – Strangford Lough.



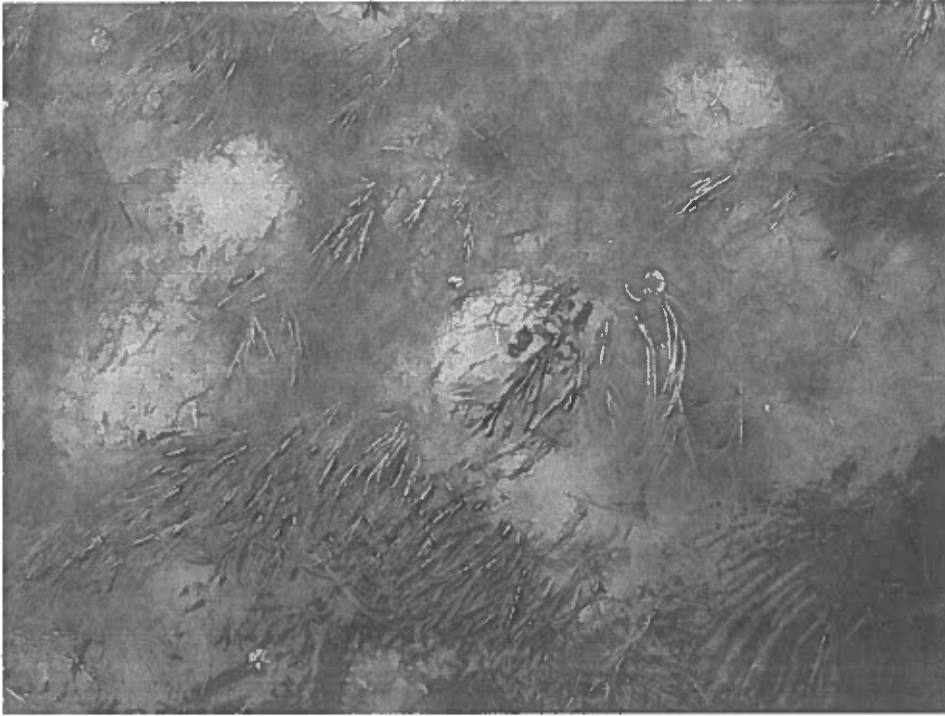


Plate 3: Mixed *Z. marina* var. *angustifolia* and *Zostera noltii*, Chapel, Strangford Lough (Chapel C 600 CU.JPG).

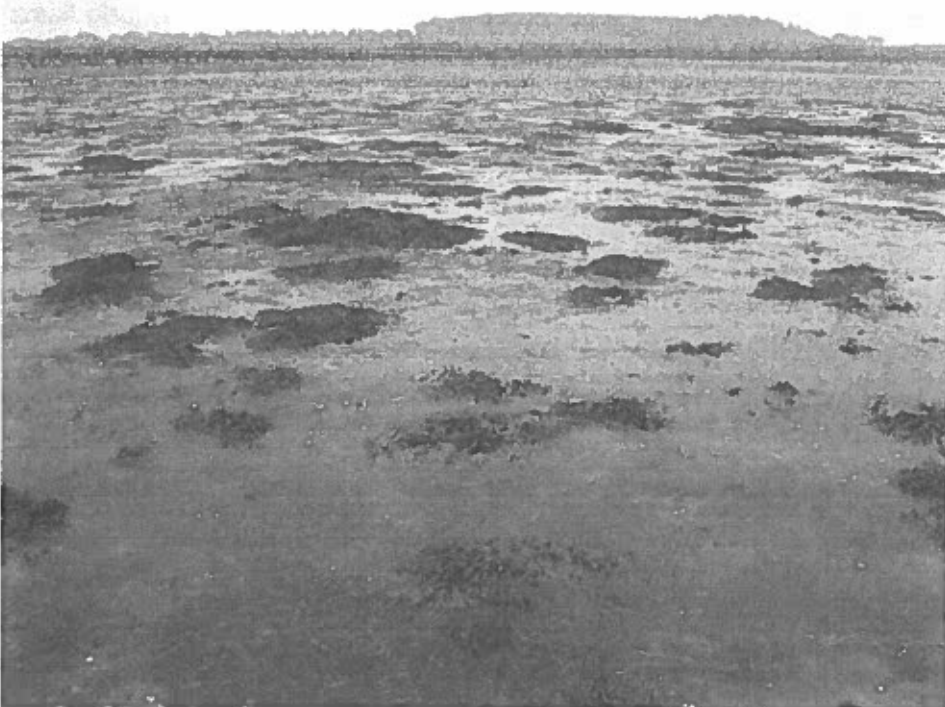


Plate 4: Mixed bed of *Zostera* spp. and fucoids, Chapel, Strangford Lough. (Chapel D 000 WA.JPG).

Site: - Strangford Lough

Sub Site: - Castle Espie

Grid Reference: J490682

Survey Dates: 20/08/2003

Site Description: - This site is on the west coast of Strangford Lough bounded to the North by Island Hill and the south by Castle Espie Pier. The Comber River flows into the west end and effectively splits the estuary in two (north and south).

Bed Description: - This site has an extensive covering of *Zostera* spp. The major area of *Zostera* is on the southern shore and covers approximately 101 ha (Castle Espie Bed C). Both species of *Zostera* are widespread. Density was considered good but not exceptional. The bed on the northern shore (Castle Espie Bed A) is more restricted and covers 12 ha. *Zostera noltii* was dominant with only occasional plants of *Z. marina* var. *angustifolia* (Plate 5). The western limit of this bed is associated with a stream to the west of which is a bed of *Enteromorpha* which is a permanent feature of the area (A. Portig, pers. obs.) and appears to limit the western distribution of this bed. One other small distinct bed is present at this site. It covers an area of 0.1 ha and is associated with the rocks known as The Cow and Calf.

Four transects taken A, B, C & D (Appendices 3a–e).

Threats: - *Spartina* is present at this site; while not extensive, it could pose a threat to *Zostera* if expansion is allowed to continue. Bait digging for *Arenicola* spp. is widespread at this site especially on the northern shore associated with the car park at Island Hill. No direct damage was observed at this time but if this practice were to be carried out within any of the beds it would cause extensive damage. Hand gathering for cockles also occurs at this site (observed north of Castle Espie Pier) and again, although outside the bed, presents another potential hazard. Vehicular damage was also observed with a set of presumably tractor marks evident across bed C (Plate 6). *Enteromorpha* is considered a threat to beds at this site, especially in the upper reaches of the estuary.

Figure 5: Distribution of *Zostera* beds and transect positions, Castle Espie – Strangford Lough.

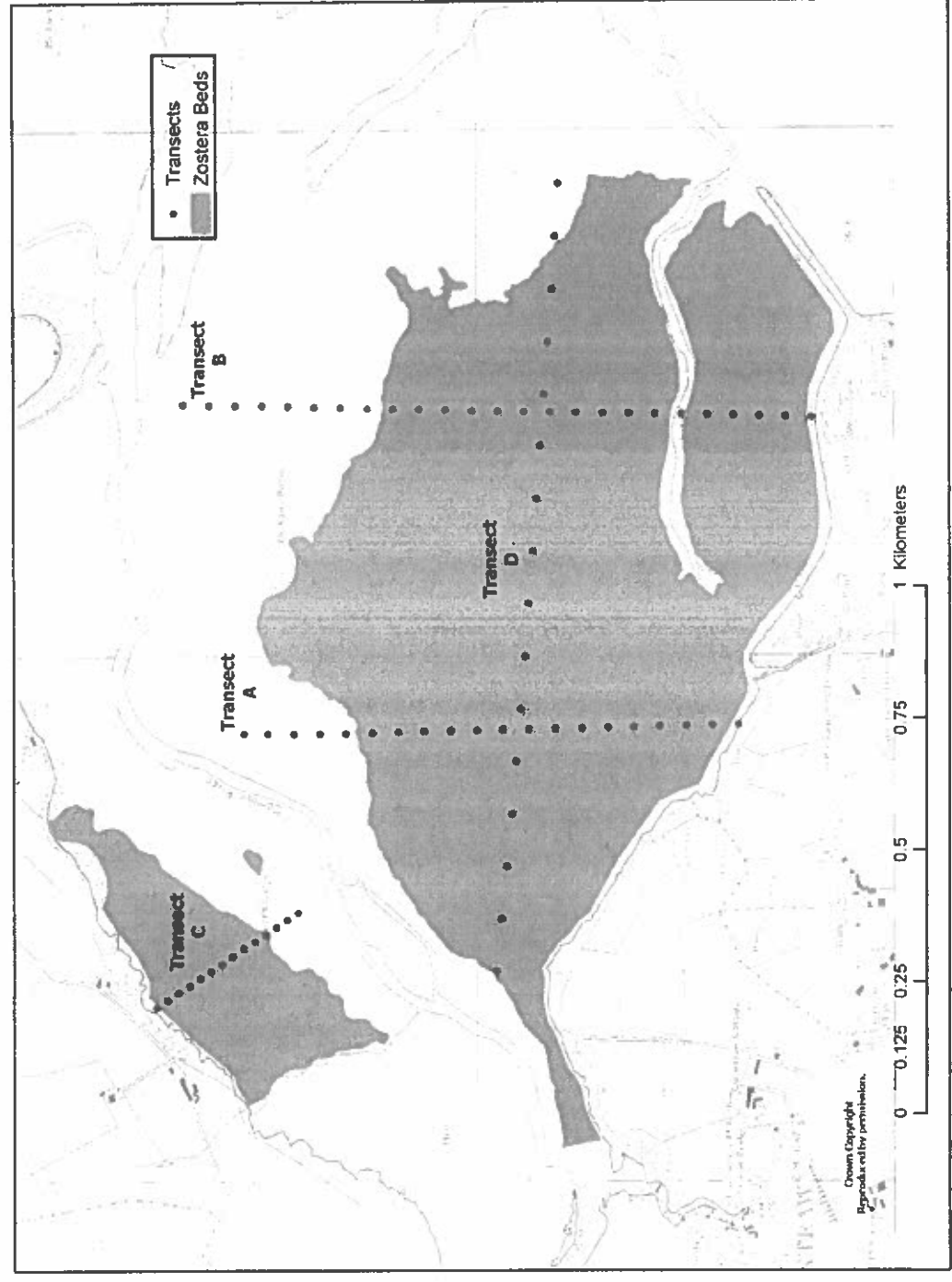




Plate 5: *Zostera noltii* bed C Castle Espie, Strangford Lough (CE C 050 WA.JPG).



Plate 6: Impact of tractor on *Zostera* bed, Castle Espie, Strangford Lough (Tractor Tracks across Castle Espie Estuary.JPG)

Site: - Strangford Lough

Sub Site: - Greyabbey

Grid Reference: J573674

Survey Dates: 01/09/2003, 02/09/2003 & 02/09/2003

Site Description: - Greyabbey Bay is situated on the east coast of Strangford Lough bounded to the north by Mid Island. The bay consists of firm sandy mud with numerous rocky outcrops and stones scattered throughout the bay.

Bed Description: - *Zostera* spp. covers wide areas of the Bay. Both *Zostera noltii* and *Z. marina* var. *angustifolia* are abundant, though as is usual in Strangford Lough, *Z. marina* var. *angustifolia* is less common on the upper shore. To the south along the embankment of the road are a series of ridges where *Zostera noltii* is the dominant species (Plate 7). Significant areas of mixed *Zostera* spp. beds also occur, on mixed substrate, i.e. where exposed rocks prevent *Zostera* spp. occurring. The bed to the north of the causeway of mid and south island is situated on softer sediments and consists of *Zostera noltii* and *Z. marina* var. *angustifolia* (Plate 8).

Four transects taken (Appendices 4a-e).

Threats: - No specific threats were identified at this site.

Figure 6: Distribution of *Zostera* beds and transect positions, Greyabbey, Strangford Lough.

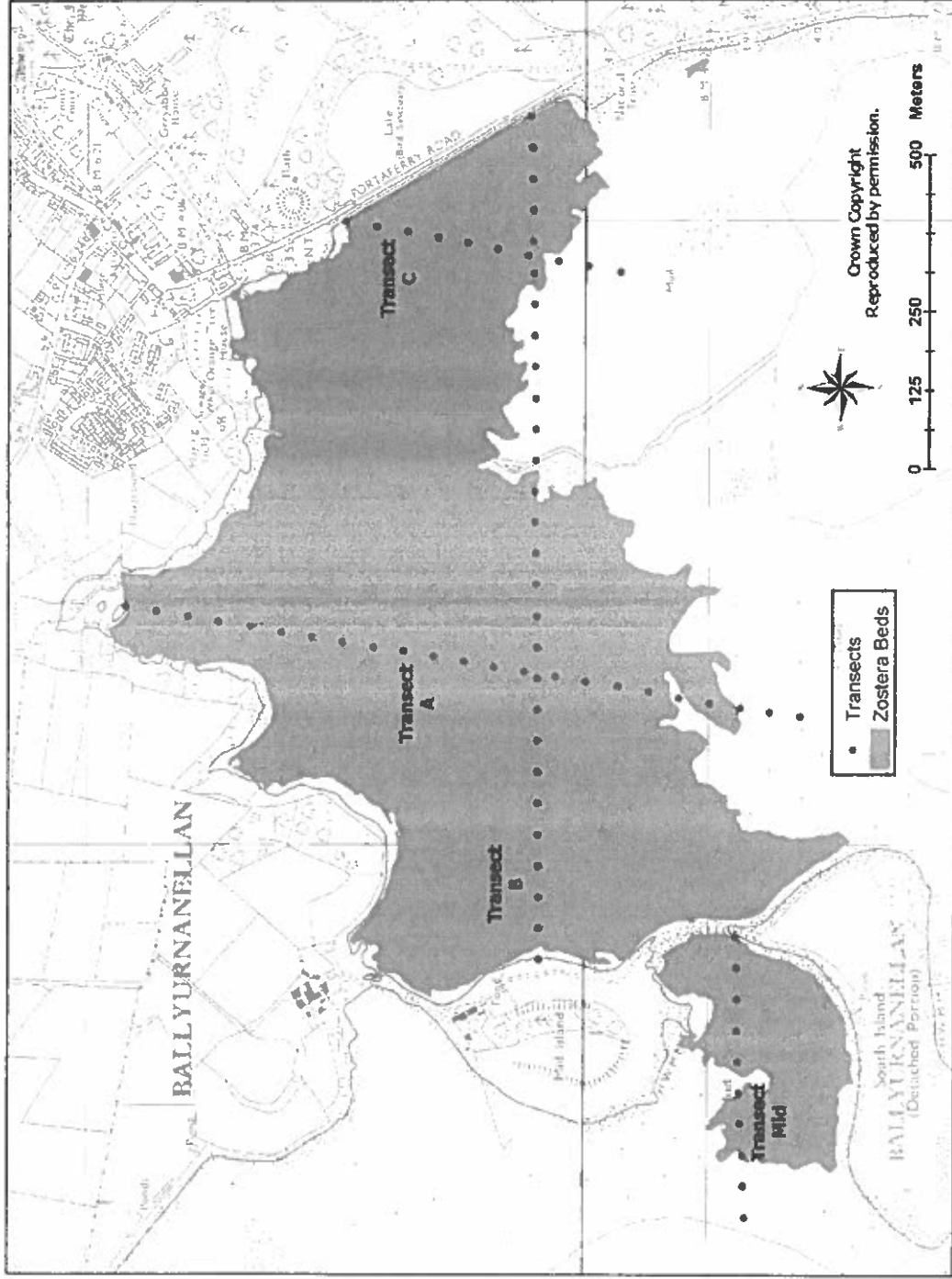




Plate 7: Ridges of *Zostera noltii* at Greyabbey, Strangford Lough. (Greyabbey C 300 WA.JPG).



Plate 8: Mixed *Zostera noltii* and *Z. marina* var. *angustifolia* bed, Greyabbey, Strangford Lough (MID SOUTH 100 WA.JPG).

Site: - Strangford Lough

Sub Site: - Seabank

Grid Reference: J525710

Survey Date: 01/09/2003

Site Description: - This is a small bay on the east coast of Strangford Lough. A ridge covered with mussels offers shelter from the prevailing winds and the bay consists of firm sandflats with an upper fringe of rocky shore. Parts of the bay consist of a mixture of boulder and sediment.

Bed Description: - *Zostera noltii* is the dominant species in this relatively small bed, although *Z. marina* var. *angustifolia* does occur it is considered occasional (Plate 9). The bed itself is uniform and occurs on the upper shore below the narrow strip of rocky shore and to the north and southern end of the bed occurs on the sediment in between the rocks. Below the main bed there are numerous small patches of *Zostera noltii* (Plate 10). One transect taken (Appendices 5a-b).

Figure 7: Distribution of *Zostera* beds and transect positions, Seabank – Strangford Lough.

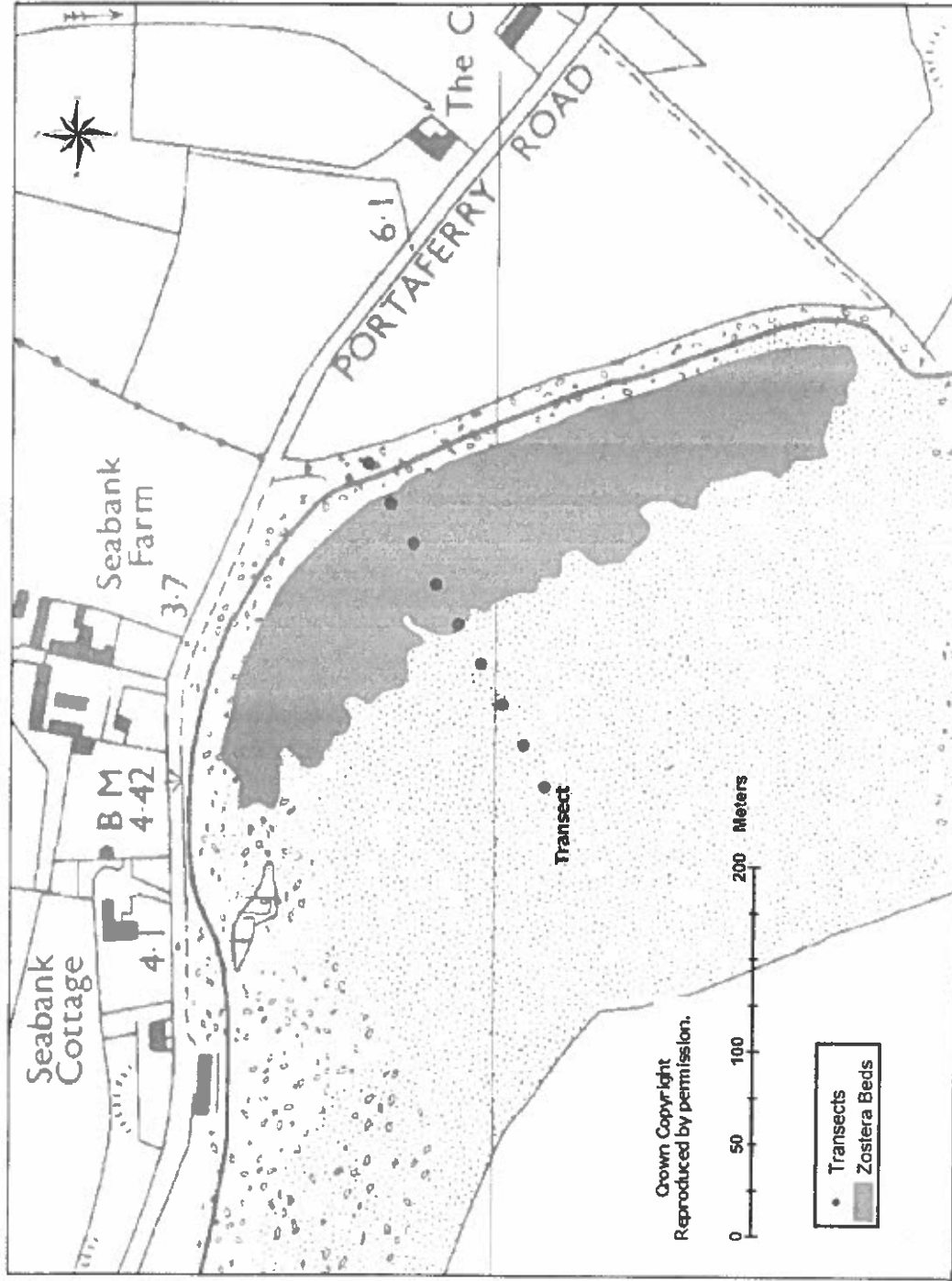




Plate 9: *Zostera noltii*, Seabank, Strangford Lough. (Seabank 025 CU.JPG).



Plate 10: Patches of *Zostera noltii* at lower edge of bed, Seabank, Strangford Lough. (Seabank 075 WA.JPG).

Site: - Strangford Lough

Sub Site: - Gasworks

Grid Reference: J554690

Survey Date: 29/08/2003

Site Description: - The Gasworks is a small series of bays on the east coast of Strangford Lough north of Chapel Island. In its upper reaches it consists of sandy mud but in the lower areas around mean low water sediments are soft with mussel bed formation especially towards Chapel Island (Caution: there are dangerous muds in this area).

Bed Description: - The Gasworks site shows considerable variation in physical parameters and *Zostera* distribution. To the south of the site (towards Chapel) the topography is such that it lies very wet. In common with Chapel, this area is a mosaic of mussels / *Fucus vesiculosus* and *Zostera* spp. (Plate 11). *Z. marina* var. *angustifolia* was considered the more abundant of the two *Zostera* species. An unidentified brown ephemeral algae is also abundant in these areas (Plate 12). The northern part of the site is more free draining and *Zostera noltii* is more abundant on the upper shore while *Z. marina* var. *angustifolia* more abundant on the lower shore. The distribution on the northern part of the site appears more restricted to the upper half of the shore and this is presumably related to the greater exposure of this area. Three transects were taken A, B & C (Appendices 6a-d).

Threats: - Ephemeral brown algae threaten to blanket *Zostera* at this site. As with the Chapel site, the balance of the mussel / *Fucus vesiculosus* / *Zostera* mosaic is unknown.

Figure 8: Distribution of *Zostera* beds and transect positions, Gasworks– Strangford Lough.

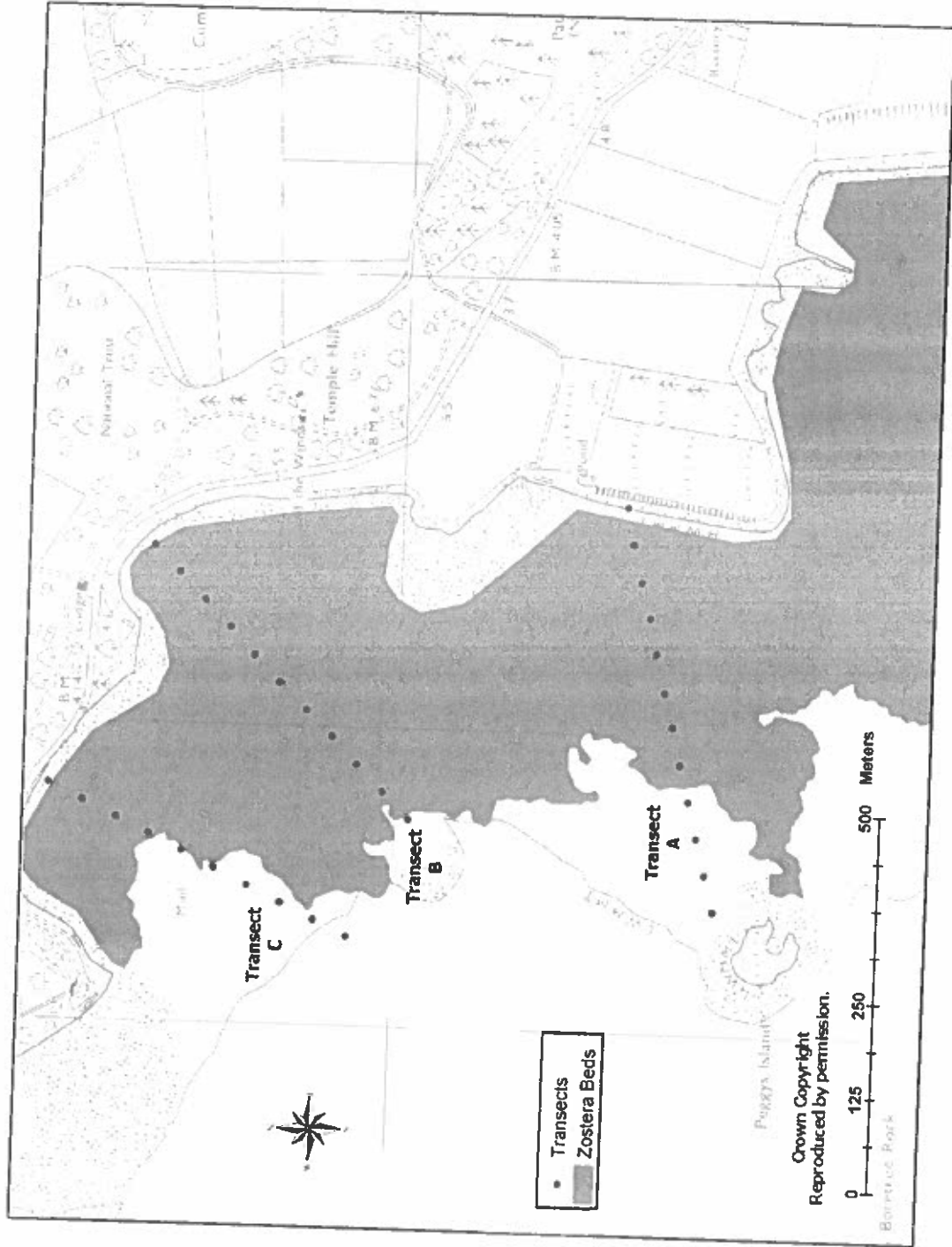




Plate 11: *Zostera* / mussel/ *Fucus* mosaic, Gasworks, Strangford Lough. (Gasworks A 300 WA.JPG).



Plate 12: *Zostera* and ephemeral brown algae, Gasworks, Strangford Lough. (Gasworks B 400 WA.JPG).

Site: - Strangford Lough

Sub Site: - Castle Espie Pier to Paddies Point

Grid Reference: J505667

Survey Dates: 12/08/2003, 18/08/2003 & 19/08/2003

Site Description: - Situated on the west coast of Strangford Lough this site covers a large area of the sandflats that occur in the area. Sediments are generally firm and much of the upper shore is boulder dominated. A small river dissects the site at Horse Island and an extensive sward of *Spartina* occurs in the upstream channel. Several mussel beds also occur along the length of the shore towards low water.

Bed Description: - *Zostera* spp. form a continuous belt from north to south in this area *Zostera noltii* was more abundant on the upper shore and *Z. marina* var. *angustifolia* more abundant on the lower shore, as is common throughout Strangford Lough. The upper limit is restricted to where sediments start and around the Horse Island area it was limited by the distribution of *Spartina*. Along most of the length of the shore *Zostera noltii* is patchy at the lower limit of its distribution and this is particularly apparent to the south of the site (Plate 13). As a result delineation of the lower edge is poor along much of this site. Six transects taken (Appendices 7a-g).

Threats: - *Spartina* is abundant at this site, especially around Hare Island (Plate 14). Spread of this species would threaten *Zostera* beds particularly in the upper reaches. Cockle harvesting also occurs in this area.

Figure 9: Distribution of *Zostera* beds and transect positions Castle Pier to Paddies Point – Strangford Lough.

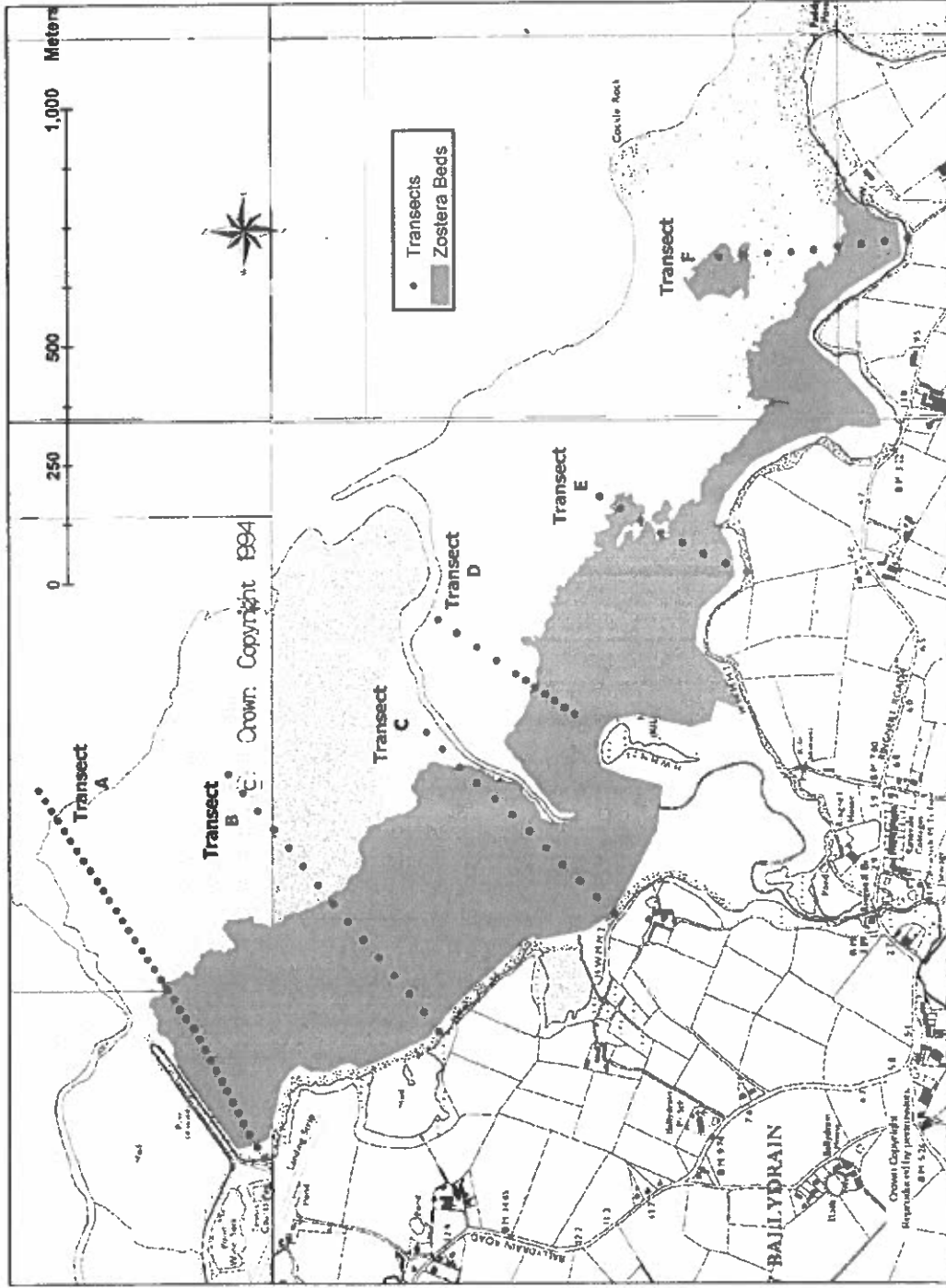




Plate 13: Patches of *Zostera noltii* at the lower edge of transect D, Castle Espie, Strangford Lough. (CEtoPP D 100WA.JPG).



Plate 14: *Spartina* on the upper reaches of transect A, Castle Espie, Strangford Lough. (CEtoPP A 025 WA.JPG).

Site: - Strangford Lough

Sub Site: - Cunningburn

Grid Reference: J544702

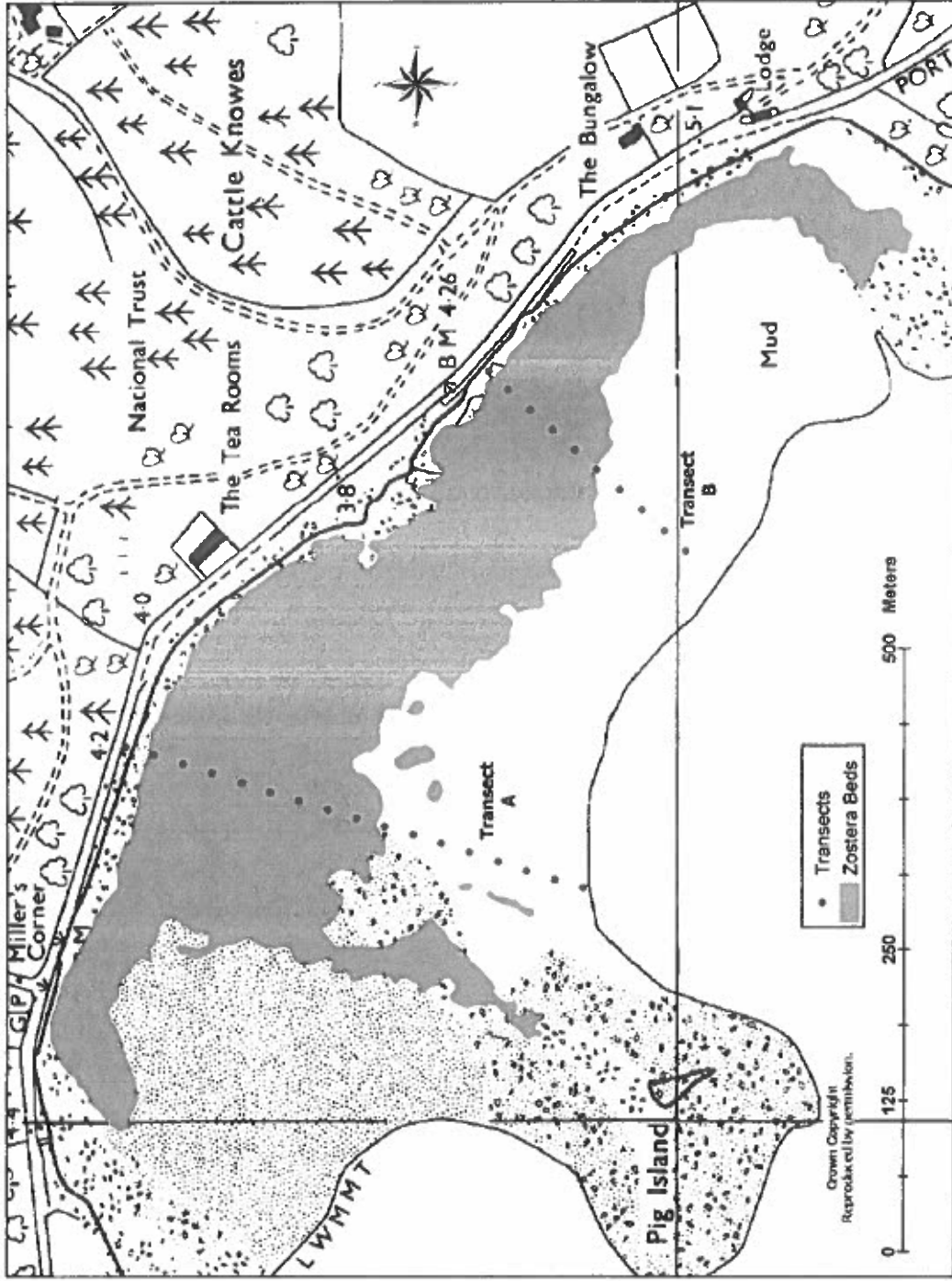
Survey Date: 01/09/2003

Site Description: - Cunningburn on the east coast of Strangford Lough is a narrow bay in the lee of Pig Island. It has a mixed substrate of boulder and clay on the upper shore and sandy mud on the lower shore which is more extensive in the lee of Pig Island.

Bed Description: - The *Zostera* bed at Cunningburn can be split into two. There is the *Zostera* that occurs amongst the boulder /clay chiefly on the upper shore and especially to the south of the site (Plate 15). In the lee of Pig Island lower on the shore *Zostera* occurs on the sandy mud and extends seaward. The distribution in this area is not continuous but patchy (Plate 16). As is common on Strangford Lough *Zostera noltii* is the more common species on the upper shore and on the drier areas and *Z. marina var. angustifolia* is more common on the lower shore and wetter areas. The patchy distribution in this area is considered to be the result of recent expansion of the bed. Two transects taken (Appendices 8a–c).

Threats: - Digging for cockles is known to occur in this area and would pose a threat if it occurred within the bed. Considerable water sport activity occurs in this area especially windsurfing and this may have a potential impact through trampling.

Figure 10: Distribution of *Zostera* beds and transect positions, Cunningham, Strangford Lough.



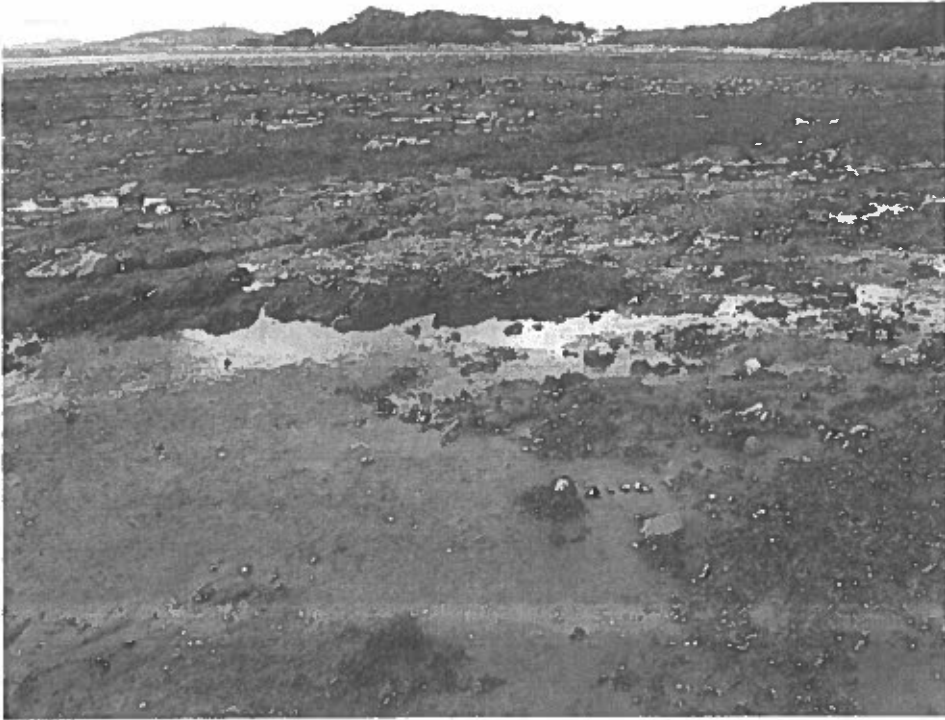


Plate 15: *Zostera* amongst exposed clay, Cunningburn, Strangford Lough. (Cunningburn B 025 WA.JPG).



Plate 16: Patchy *Zostera noltii* at lower edge of transect A, Cunningburn, Strangford Lough. (Cunningburn A 200 WA.JPG).

Site: - Strangford Lough

Sub Site: - Ringneill Bay

Grid Reference: J517655

Survey Dates: 30/08/2003, 05/09/2003 & 06/09/2003

Site Description: - Ringneill Bay is a bay off Ardmillan Bay on the west coast of Strangford Lough. The sediments on the upper shore are sandy mud with soft muds occurring lower down the shore. Extensive *Spartina* swards occur in the upper reaches.

Bed Description: - In its upper reaches this is a uniform bed of *Zostera noltii* and *Z. marina var. angustifolia* dominated by the former. The upper limit is bound by the *Spartina* sward, though both *Zostera* species are abundant in some of the pools within the sward. The lower part of the bed is fragmented with numerous patches of *Zostera noltii* and individual plants of *Z. marina var. angustifolia* (Plate 17). Over recent years this bed has been exhibiting an erratic expansion down the shore (A. Portig, unpubl. data).

Threats: - *Enteromorpha* is abundant in this bay. *Spartina* is also abundant at this site (Plate 18).

Figure 11: Distribution of *Zostera* beds Ringneill Bay – Strangford Lough.

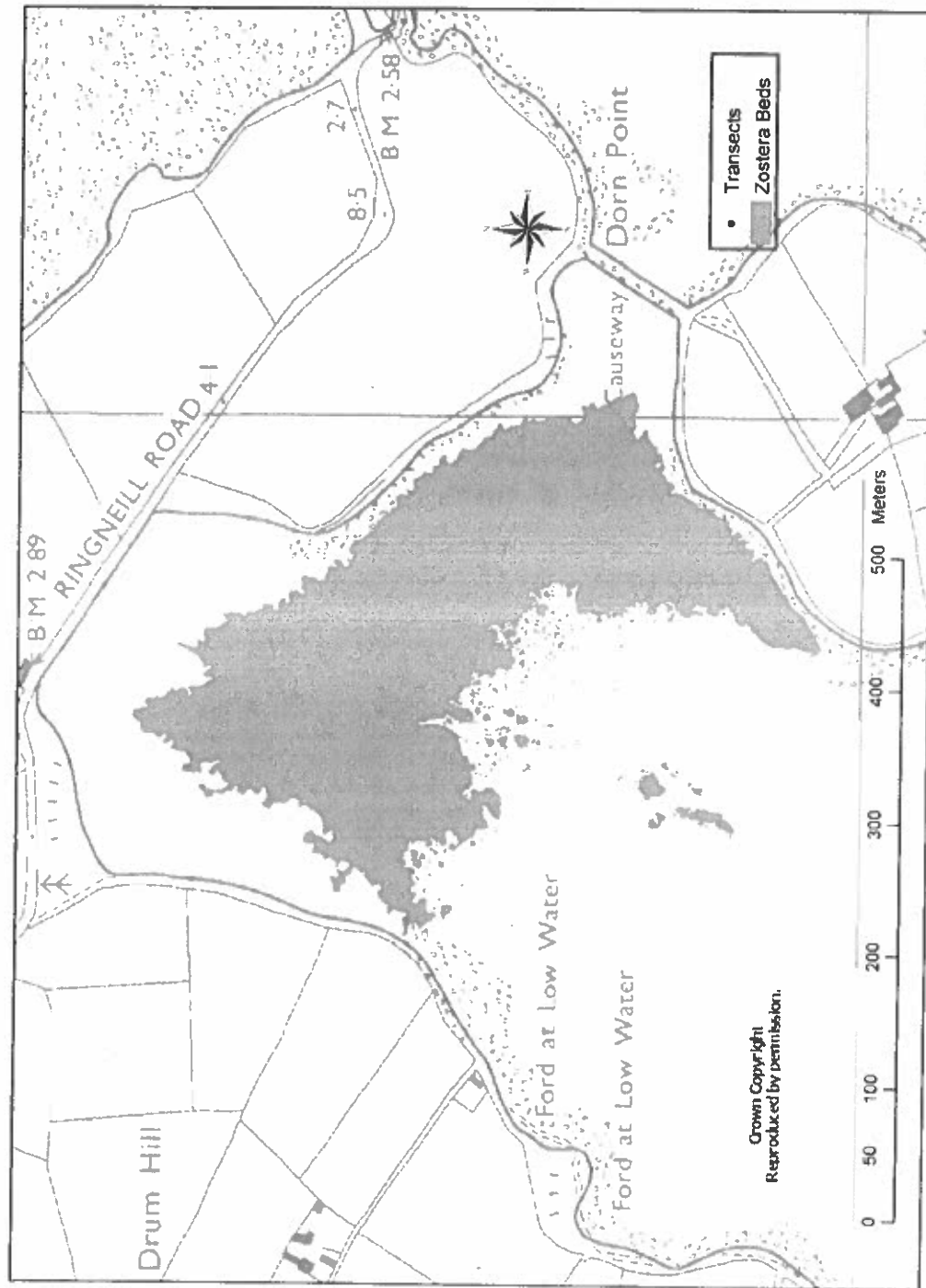




Plate 17: Lower edge of *Zostera* bed, Ringneill Bay, Strangford Lough Photo 2002.
(Lower edge of Bed Ringneill, Bay.JPG).



Plate 18: Mixed *Spartina* sward and *Zostera*, Ringneill Bay, Strangford Lough Photo 2002. (*Spartina Zostera* Ringneill Bay.JPG).

Site: - Strangford Lough

Sub Site: - Chambers Bay.

Grid Reference: J524657

Survey Date: 30/09/2003

Site Description: - Chambers Bay is a relatively sheltered bay on the west coast of Strangford Lough. The southern edge is partly bounded by a causeway built between the mainland and Reagh Island. Sediments are mixed with sandy muds and boulders occurring on the western shore and a mixture of mud and sandy mud on the south eastern shore.

Bed Description: - The bed to the west occurs in a mosaic of *Zostera* and the brown algae *Ascophyllum nodosum*. *Zostera noltii* is the dominant *Zostera* species where the substrate allows (Plate 19). On the eastern shore both species are abundant and the density is relatively high. The main feature of this bed is its position on the shore. *Zostera* occurs low on the shore (down to approx low water neap) and there are bare sediments above. This is the reverse of the normal distribution for these species where it is usually the upper shore that is occupied.

Threats: - No specific threats were identified at this site.

Figure 12: Distribution of *Zostera* beds Chambers Bay – Strangford Lough.

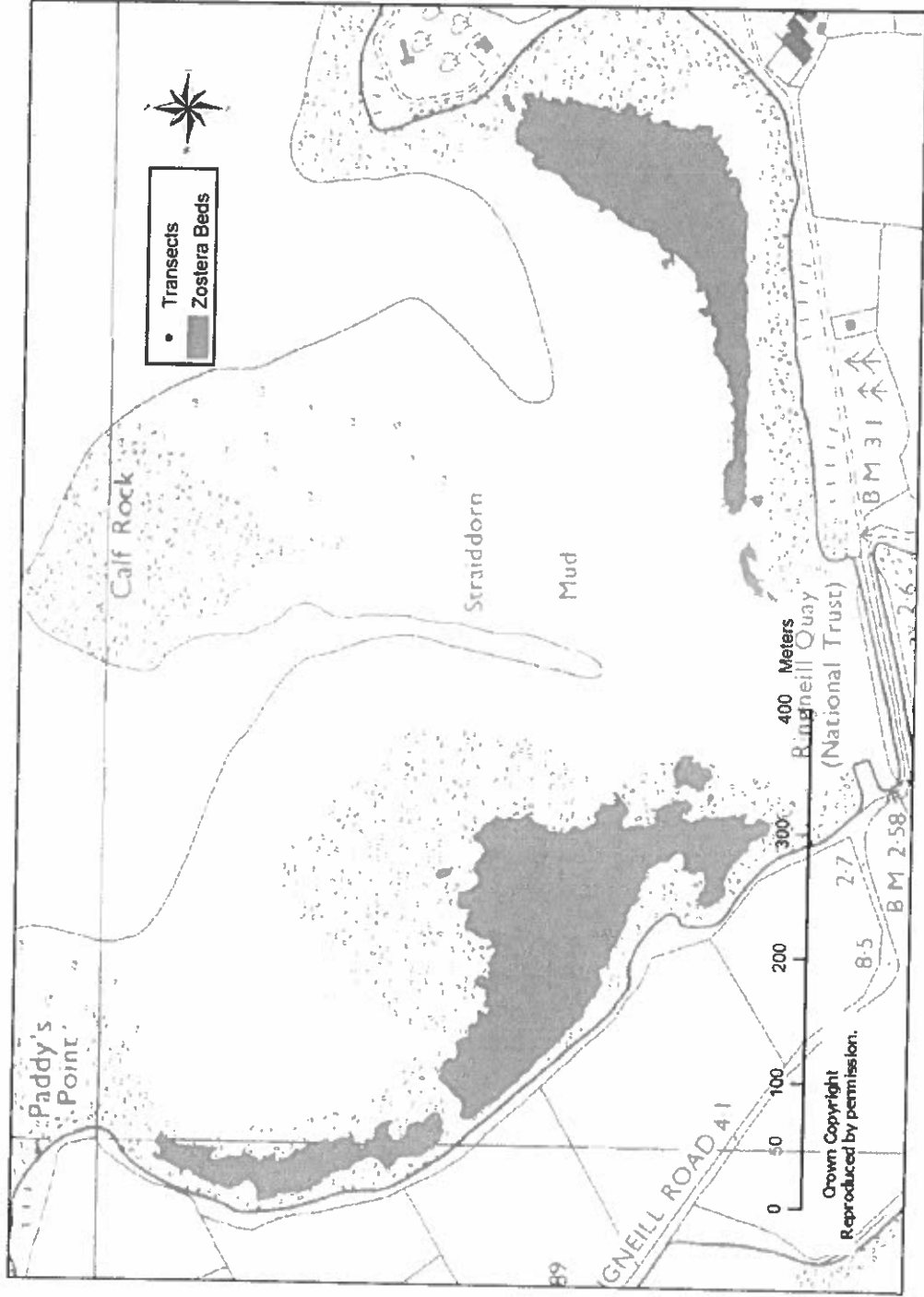




Plate 19: Mixed bed of *Zostera noltii* and *Ascophyllum*, Chambers Bay, Strangford Lough. (Mixed *Zostera* Asc.JPG)

Site: - Strangford Lough

Sub Site: - Cross Island.

Grid Reference: J528652

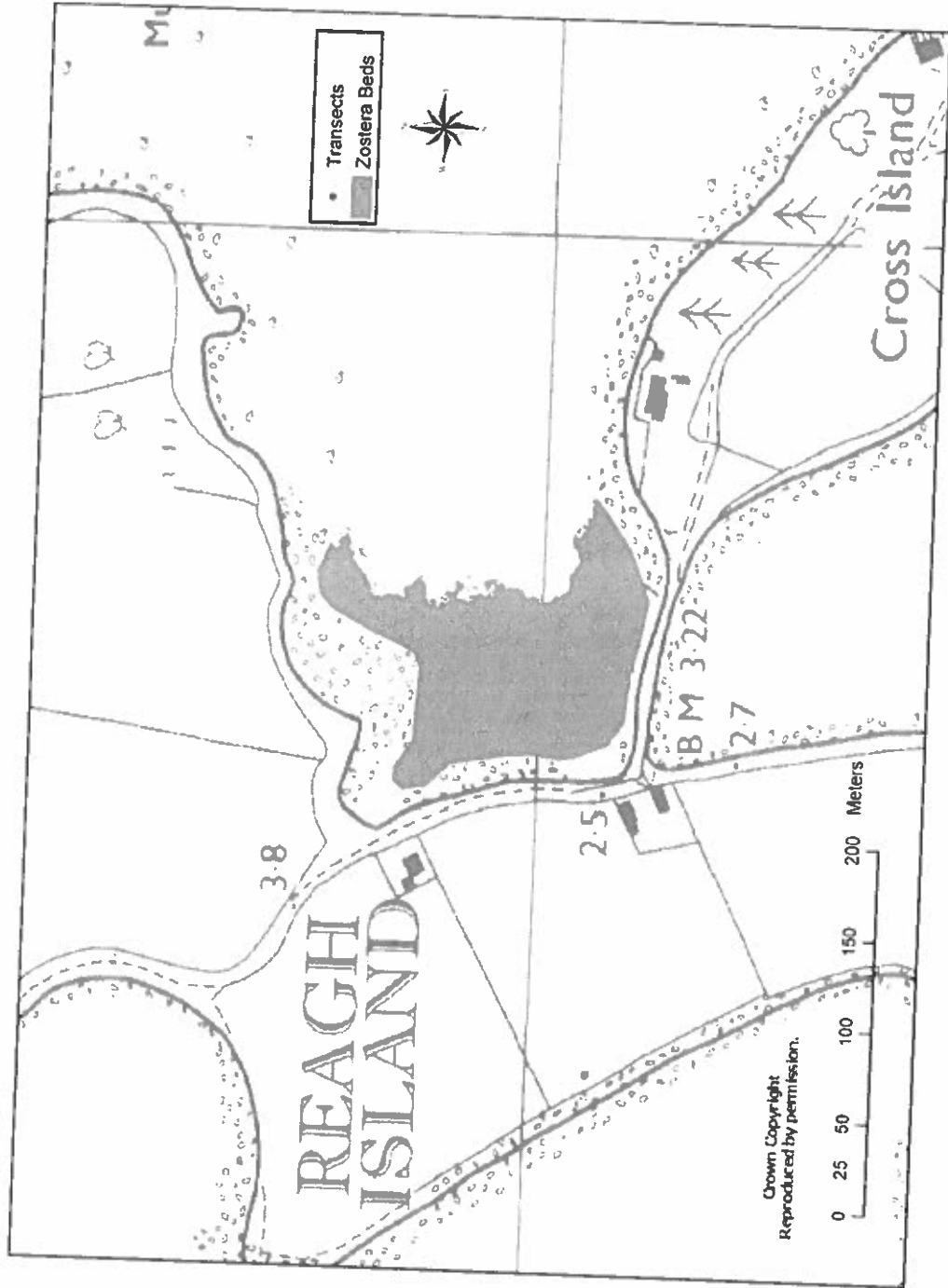
Survey Date: 04/09/2003

Site Description: - Cross Island Bay is a small sandy mud bay on the west coast of Strangford Lough, it is bounded to the south by a causeway and the upper shore is rocky.

Bed Description: - A continuous bed of *Zostera noltii* bed occurs on the upper reaches of this bay. Density is uniform and the bottom edge of the bed has only a few small patches. This bed has historical biomass and distribution data from the early 1990s (Portig, 1997; Malvarez *et al.* 2000).

Threats: - *Enteromorpha* can form on this bed. Bait digging has occurred in this bay in the past.

Figure 13: Distribution of *Zostera* beds Cross Island – Strangford Lough.



Site: - Strangford Lough

Sub Site: - Black Neb.

Grid Reference: J594617

Survey Date: 2002

Site Description: - Black Neb is a rocky promontory on the east coast of Strangford Lough south of Kircubbin.

Bed Description: - This is one of only two intertidal beds of *Zostera marina* found the other is in Kircubbin Bay. This bed occurs in a sediment-lined rock pool on the promontory. The form of *Zostera marina* that occurs here is unusual because it is not immediately apparent that it is the perennial form. The plants are smaller in size than is typically found in perennial form of *Zostera marina* though *Zostera* is known to be very variable in its morphology (Den Hartog, 1972). (Plate 20 & 21). The delineation of this bed was carried out in 2002.

Threats: - No threats were apparent, though the small size of bed makes it vulnerable.

Figure 14: Distribution of *Zostera marina* Black Neb - Strangford Lough.

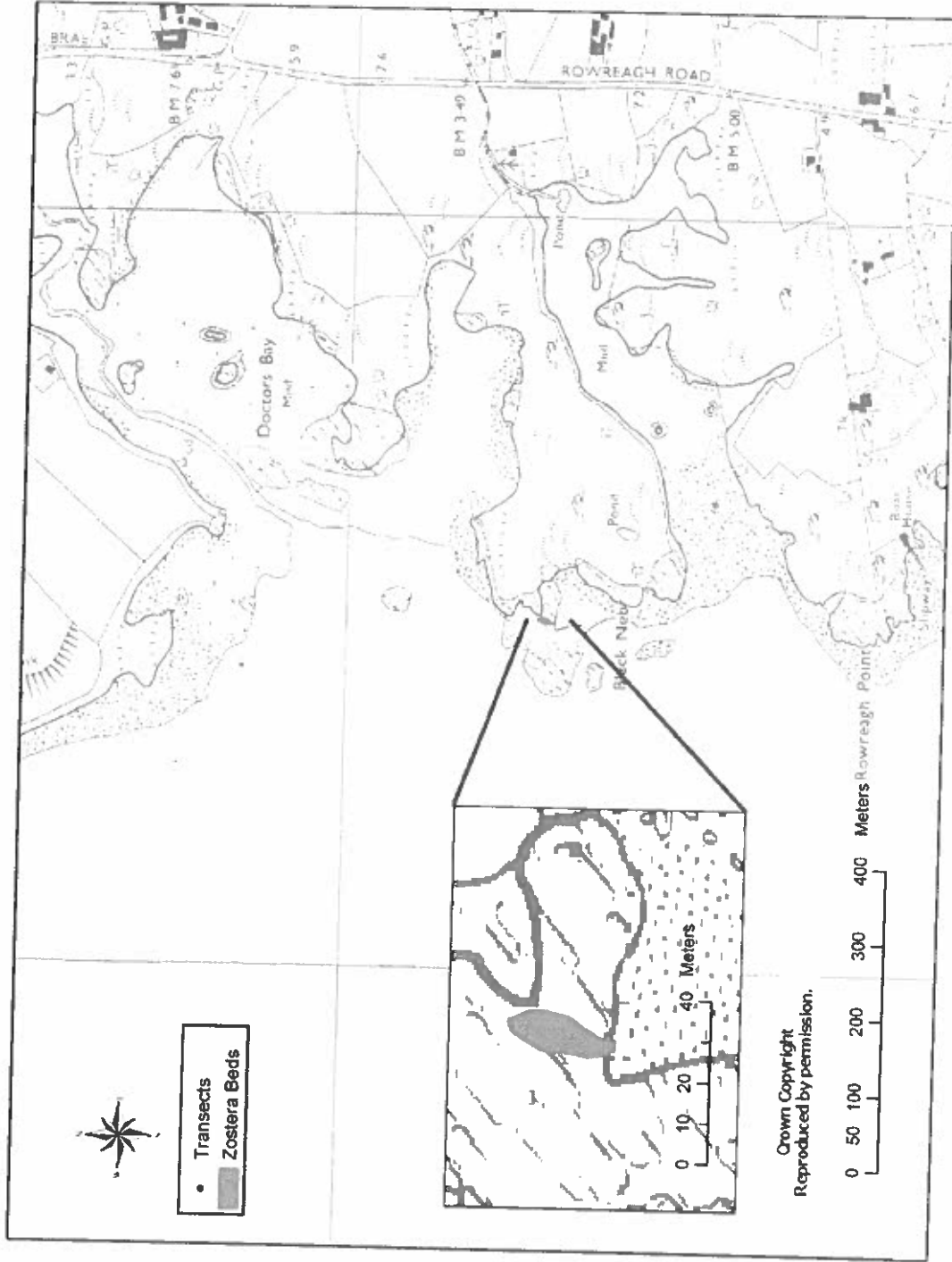




Plate 20: *Zostera marina* Black Neb, Strangford Lough. (*Zostera marina* Black Neb2.JPG)



Plate 21: *Zostera marina* Black Neb, Strangford Lough. (*Zostera marina* Black Neb.JPG)

Site: - Strangford Lough

Sub Site: - Kircubbin.

Grid Reference: J595632

Survey Date: 04/09/2003

Site Description: - Kircubbin is a relatively exposed bay on the east coast of Strangford Lough. It has a rocky upper shore with sandy sediments occurring below.

Bed Description: - This site is included as it is one of only two sites known in Northern Ireland where the perennial form of *Zostera marina* has been found growing above high water neap (Photo 22 & 23). Two other small patches (<2m²) also occur in the bay. *Zostera marina* does occur in the subtidal zone of the bay and the top part of the bed can be exposed at extreme low water springs.

Threats: - No threats were apparent but this bed is extremely vulnerable due to its small size and position.

Figure 15: Distribution of *Zostera marina*, Kircubbin – Strangford Lough.

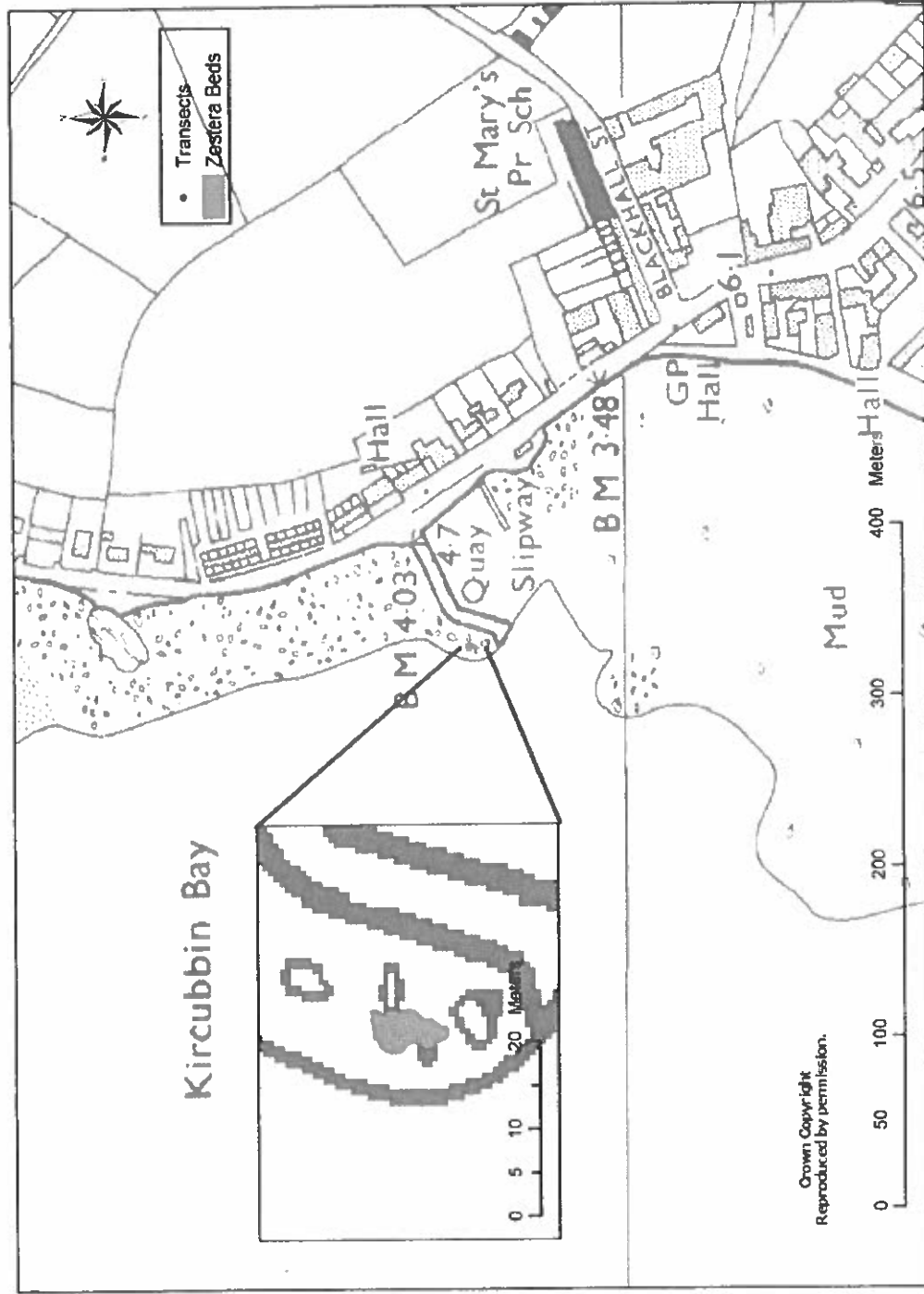




Plate 22: Intertidal *Zostera marina* in Kircubbin Bay, Strangford Lough. (*Zostera marina* Kircubbin WA.JPG).

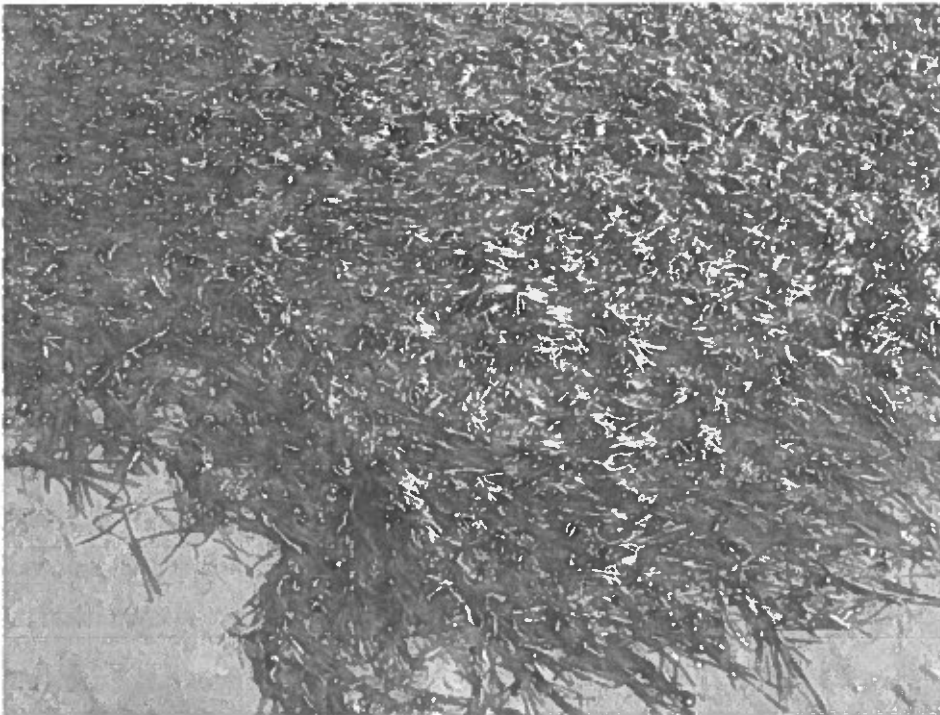


Plate 23: Intertidal *Zostera marina* in Kircubbin Bay, Strangford Lough. (*Zostera marina* Kircubbin CU.JPG).

Site: - Lough Foyle.

Grid Reference: C612270

Survey Dates: 25/08/2003, 26/08/2003, 27/08/2003 & 28/08/2003

Site Description: - Lough Foyle is a large estuary $\approx 200\text{km}^2$ on the north west corner of Northern Ireland. It has a tidal range between 1-2m and has extensive mudflats on the southern and eastern shores. Much land reclamation has occurred in the past with much of the upper shore dominated by seawalls or embankments.

Survey Coverage: - Lough Foyle was surveyed extensively and coverage was good. However, it was not possible to survey bed V (East of Longfield Levels) using the current methods, as the sediments in this area are too soft. No up to date aerial photography was found for this site so the distribution was based on the best available data which was a survey carried out by Matthew Tickner (RSPB) in 1999. Thus, data for this bed are out of date. The distribution agrees with the current observations though little can be said about species composition and biomass. The bed is not continuous with mussel beds and large amounts of *Enteromorpha* spp. present.

***Ruppia* spp.** No *Ruppia* spp. were observed at this site.

***Zostera marina*.** No perennial *Zostera marina* was observed at this site, either as "drift" or *in situ*.

Bed Description: - Extensive beds of *Zostera* spp. occur in Lough Foyle and are split into three groups for convenience. These are north of the Roe Estuary (Beds A-J), south of the Roe Estuary (Beds K-U) and bed V.

North of the Roe estuary (Beds A to J) these cover an area of 47 ha i.e. 25% of *Zostera* habitat. *Zostera noltii* is the dominant species. No *Z. marina* var. *angustifolia* was recorded in this area. The substrates in this area are firm sand, except close to the Roe Estuary itself. There is a gradation from north to south; further south the beds become larger, less patchy and of higher density. See Plate 24 for a low density bed of *Zostera noltii* in this area (Bed C).

South of the Roe Estuary Beds K to U cover an area of 45 ha. *Zostera noltii* is again the dominant species. *Z. marina* var. *angustifolia* occurs occasionally, with only 2 records on the transects. The sediments in these areas are muddier and the density of *Zostera noltii* is greater and more uniform (Plate 25).

Bed V This covers an area of approx 120 hectares. This bed occurs in an area of soft sediment and as such it was not possible to map the bed accurately. Both *Zostera noltii* and *Z. marina var. angustifolia* were present and locally abundant though considerable amounts of *Enteromorpha* spp. was also apparent in the area (Plate 26). The uniformity of cover is likely to be low as a significant number of mussel beds also occur in the area. The lack of recent aerial photography for this area meant that a current map for this area was impossible. The extent of this bed was thus based on work by the RSPB (Mathew Tinkner) using oblique aerial photography taken in 1999.

Eleven transects taken (Appendices 9a-l).

Threats: - Vehicular damage was apparent in the area to the North of the Roe Estuary with track marks apparent in the sand (Plate 28) and an abandoned car in the middle of bed G (Plate 29). Bait digging was also observed in the area. In bed J along transect A the movement of cattle over the shore had resulted in pitting of the sediments which was damaging the *Zostera* (Plate 30). Dumping of rubble and other material along the top of the shore is evident along this stretch. The impact of bait digging was apparent South of the Roe Estuary at bed M (Plate 31). *Spartina* was apparent along much of this section with patches occurring in the middle of some beds (Plate 32). Large amounts of *Enteromorpha* spp. were present in bed V.

Figure 16: Distribution of *Zostera* beds and transect positions, Lough Foyle.

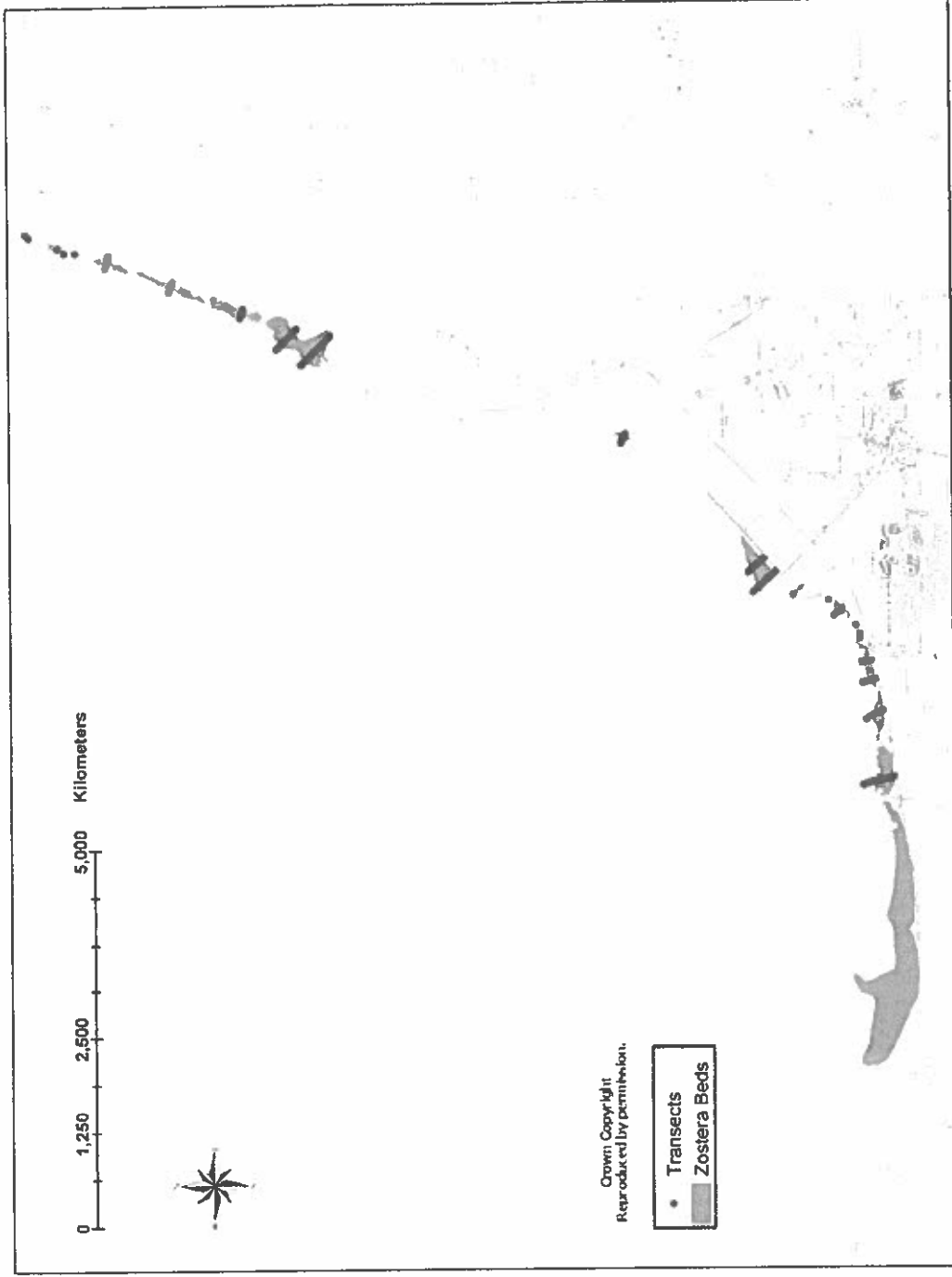


Figure 17: Distribution of *Zostera* beds and transect positions, Lough Foyle North.

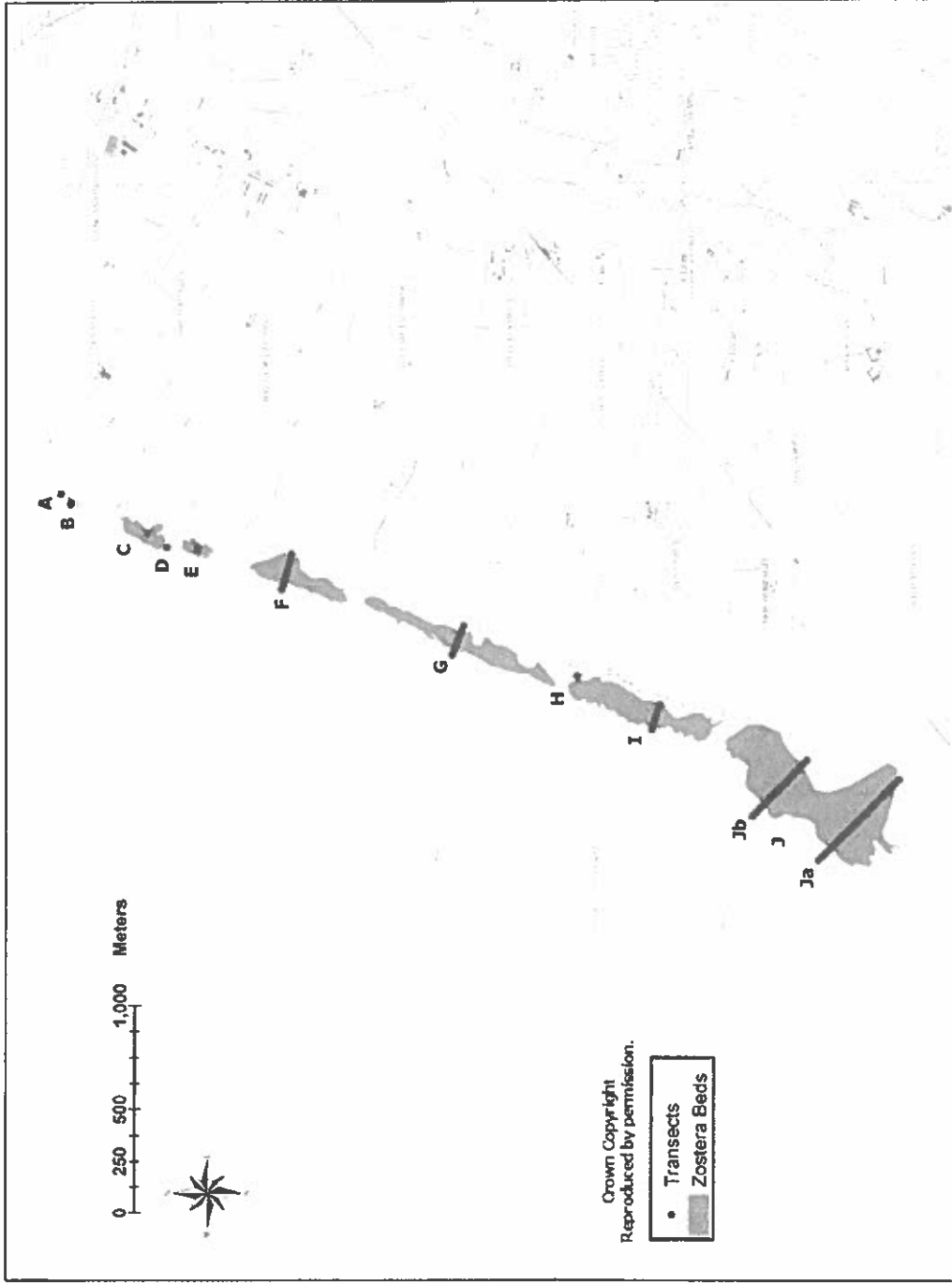


Figure 18: Distribution of *Zostera* beds and transect positions, Lough Foyle South.

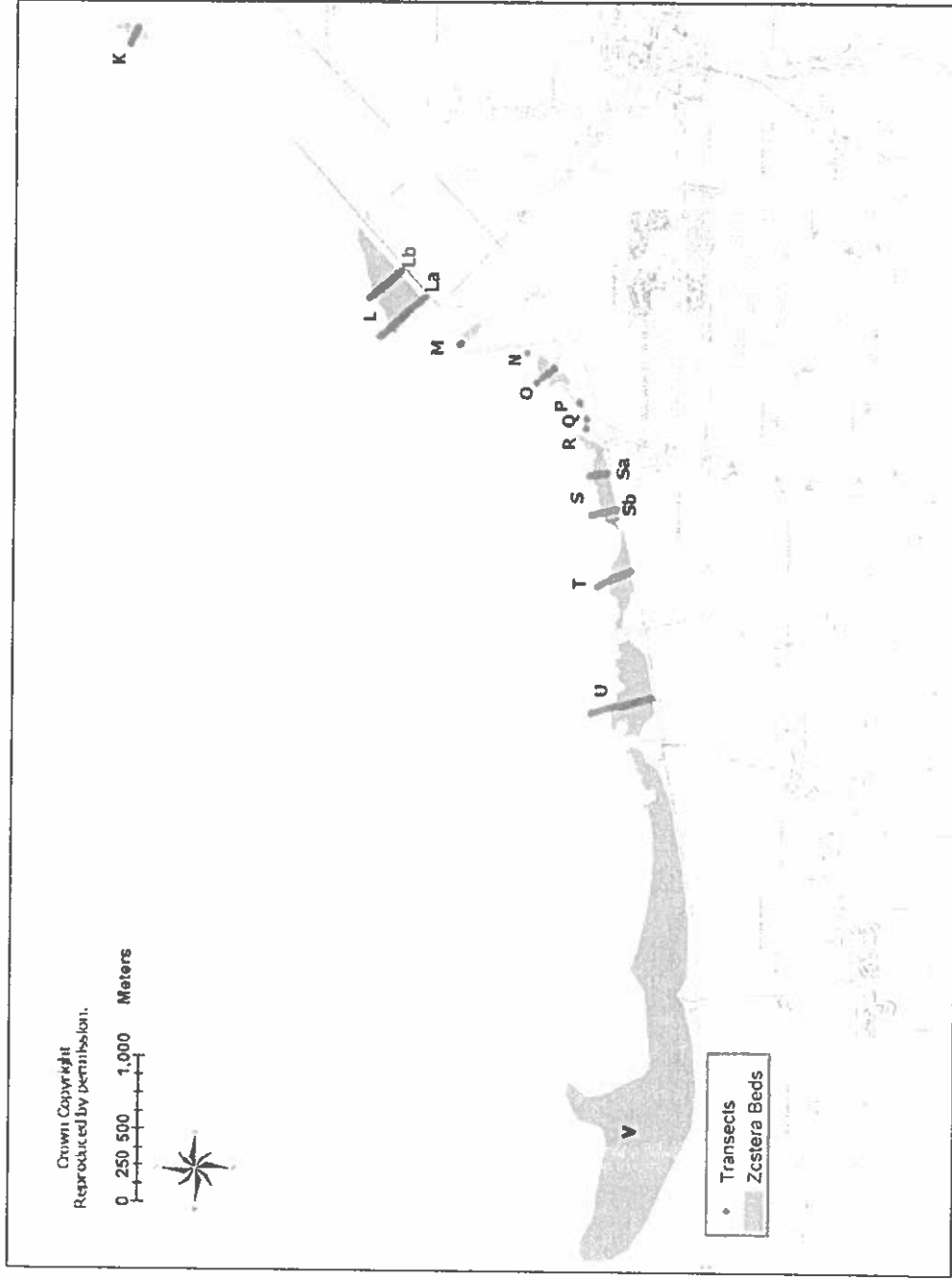




Plate 24: Sparse *Zostera noltii* in bed C, Lough Foyle. (LF C WA.JPG).

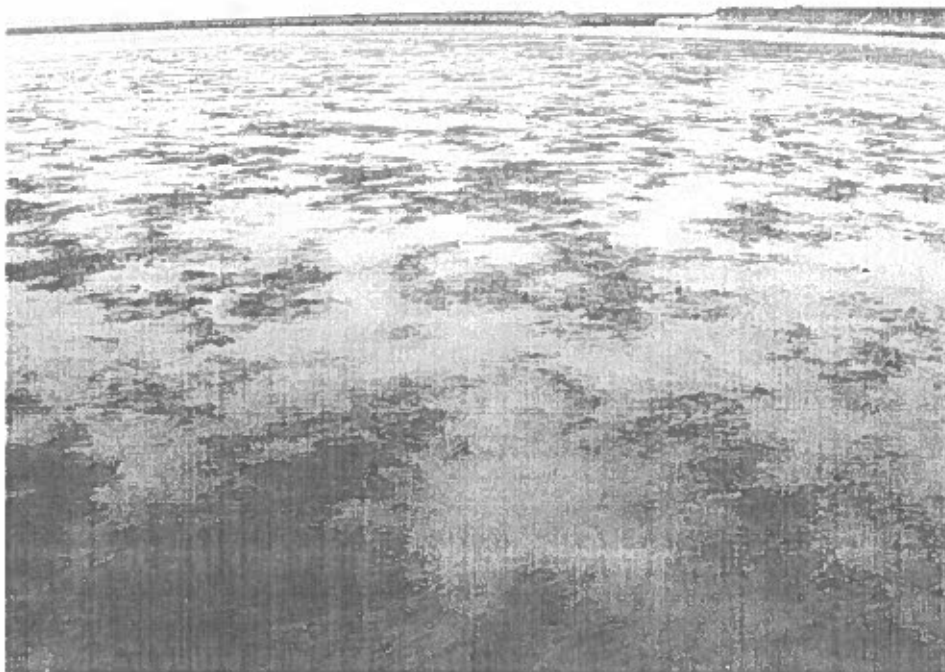


Plate 25: *Zostera noltii* in bed K, Lough Foyle. (LF K 050 WA.JPG).



Plate 26: Mussel bed and sparse *Zostera* in bed V, Lough Foyle. Pre-survey Photo.

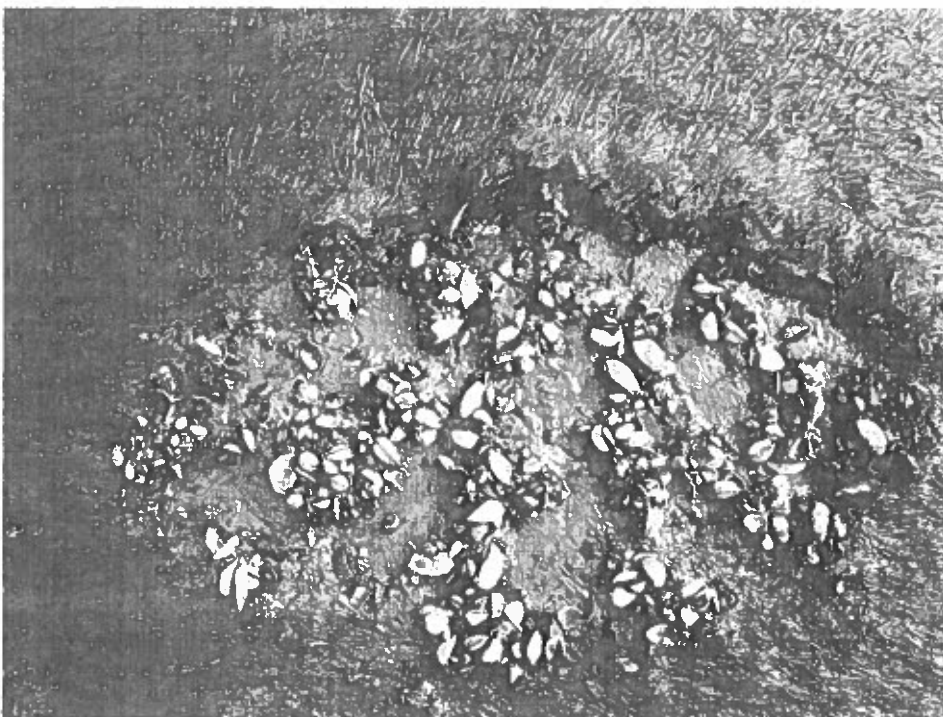


Plate 27: Mussels within *Zostera noltii* in bed S, Lough Foyle. (LF Sb 100 CU.JPG).

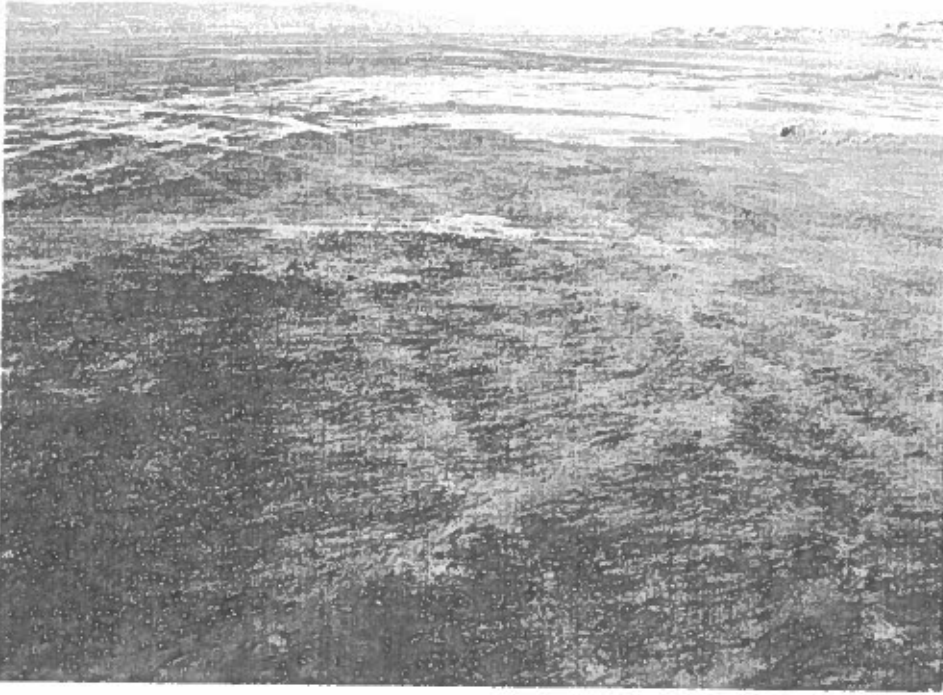


Plate 28: Vehicle tracks in *Zostera noltii* at bed F, Lough Foyle. (LF I 025 WA.JPG).

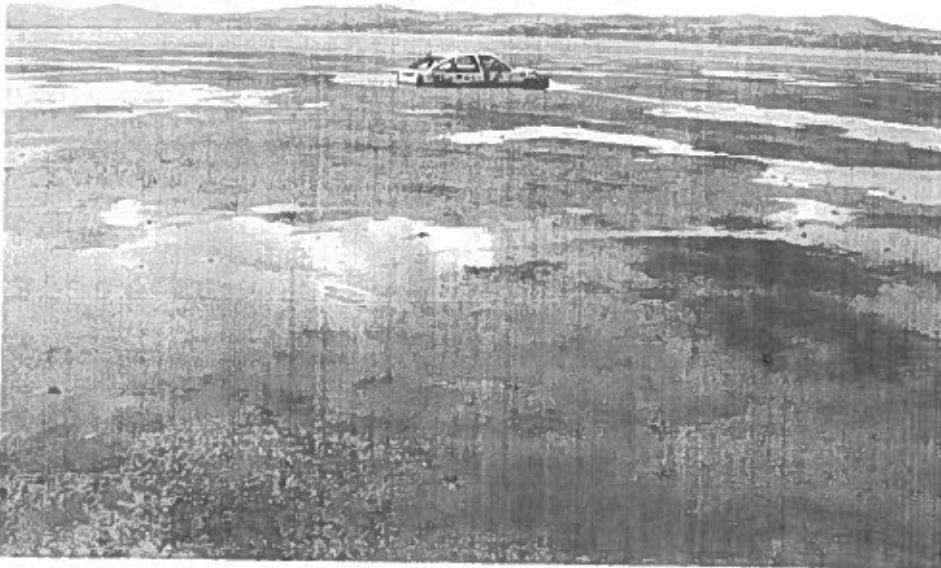


Plate 29: Abandoned car in bed F, Lough Foyle. (LF G Car On Shore.JPG).



Plate 30: Impact of trampling by cattle in bed J, Lough Foyle. (LF Ja 000 WA.JPG).



Plate 31: Impact of bait digging in bed M Lough Foyle. (LF M Damage caused by bait digging.JPG).

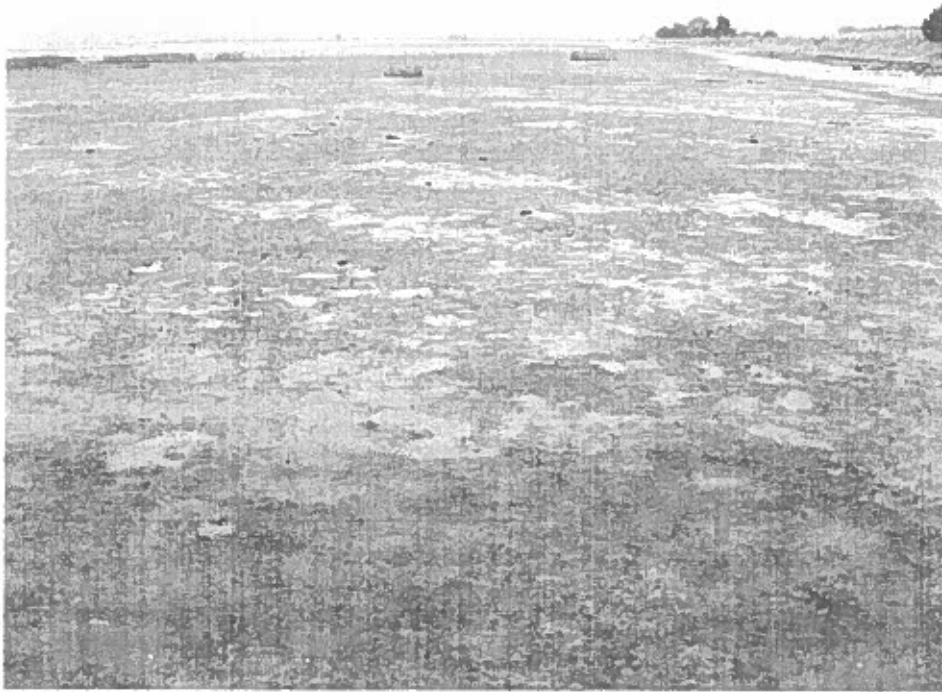


Plate 32: *Spartina* growing within bed T Lough Foyle. (LF T 025 WA.JPG).

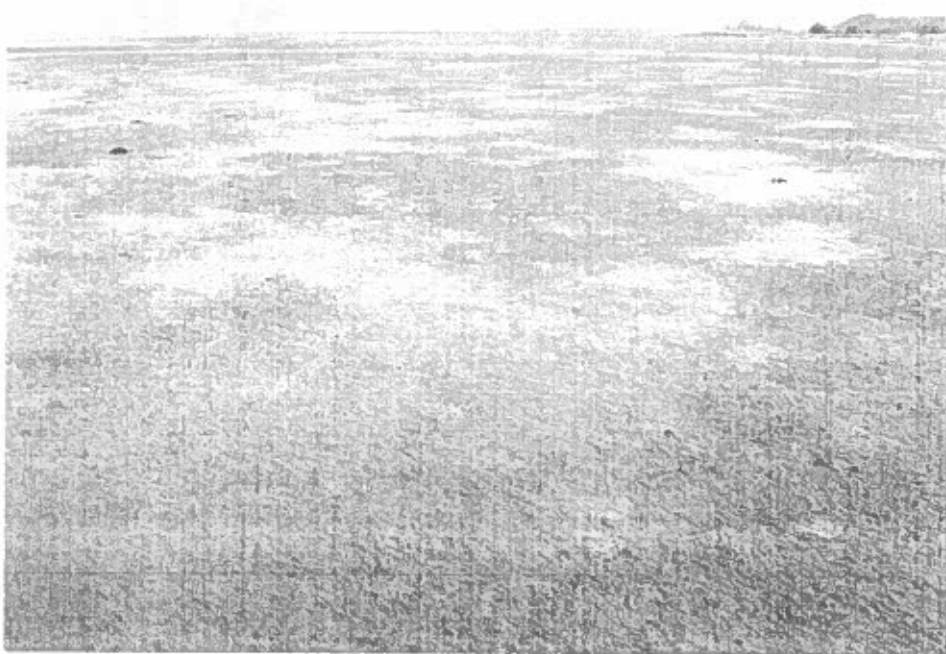


Plate 33: Bed of *Zostera noltii* at bed F, Lough Foyle. (LF U 075 WA.JPG).

Site: - Dundrum**Grid Reference:** J410370**Survey Dates:** 23/07/2003, 10/09/2003 & 18/09/2003

Site Description: - Dundrum Bay is on the south east coast of Co. Down. It is almost enclosed and has only a narrow entrance to the Irish sea. The sediments of the Bay are varied with sandy muds on the north western shore and soft sediments at Murlough and to the north.

Survey coverage: - Coverage of Dundrum Bay was extensive, though east of Downshire bridge was not complete due to the nature of sediments and an extensive covering of *Enteromorpha* spp. meaning that some *Zostera* spp. could have been present beneath these. Access to the western shore was gained through Ballykinler army base.

Bed Description: - The *Zostera* beds of Dundrum Bay are highly fragmented and there are no continuous large beds. The bed to the north west (Dun 22) consists of both species. It is highly variable in density and is fragmented with abundant *Enteromorpha* spp. A narrow, fragmented strip of *Zostera noltii* extends to the north along the upper shore from this bed. The beds on the eastern shore again consist of fragmented beds of *Zostera noltii* and one small bed of *Z. marina* var. *angustifolia*. These are chiefly restricted to the extreme upper shore. The bed to the south (MUR) is almost entirely composed of *Z. marina* var. *angustifolia* with only a few small patches of *Zostera noltii*. Within the bed, the density of *Z. marina* var. *angustifolia* is generally low with good cover only towards the middle of the bed (Plate 34). *Enteromorpha* spp. are again abundant. Two transects taken (Appendices 10a–c).

Threats: - This site is heavily impacted. *Enteromorpha* spp. is very abundant and smothering the *Zostera*. In many areas the density of *Enteromorpha* spp. was considered to be great enough to prevent growth of *Zostera* spp. (Plate 35). Decay of *Enteromorpha* spp. and resultant anoxia was observed. The western beds were heavily impacted by vehicular traffic along the upper shore.

Figure 19: Distribution of *Zostera* beds and transect positions, Dundrum Bay.

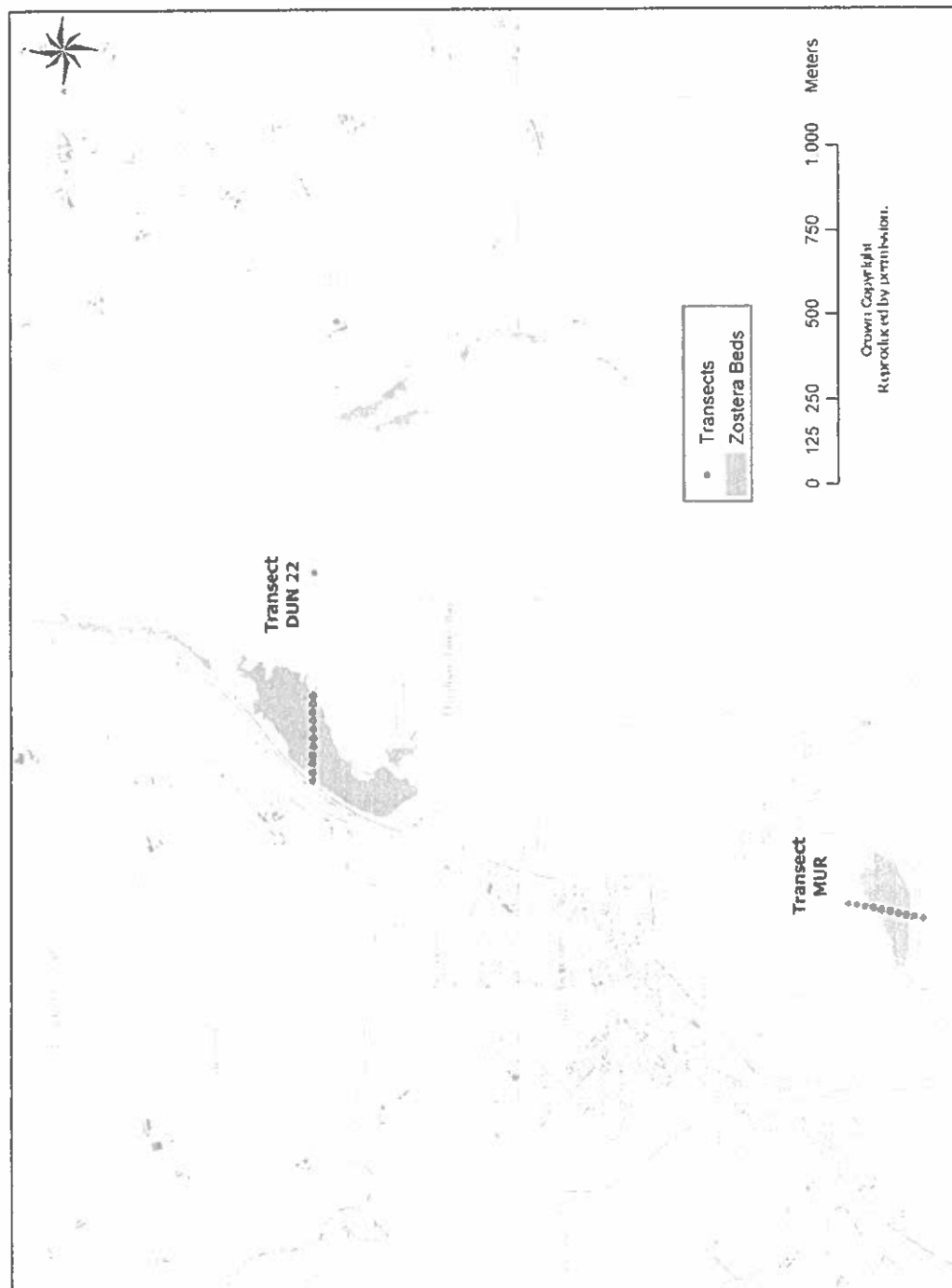




Plate 34: *Z. marina* var. *angustifolia* and *Enteromorpha* spp. in bed MUR Dundrum Bay.

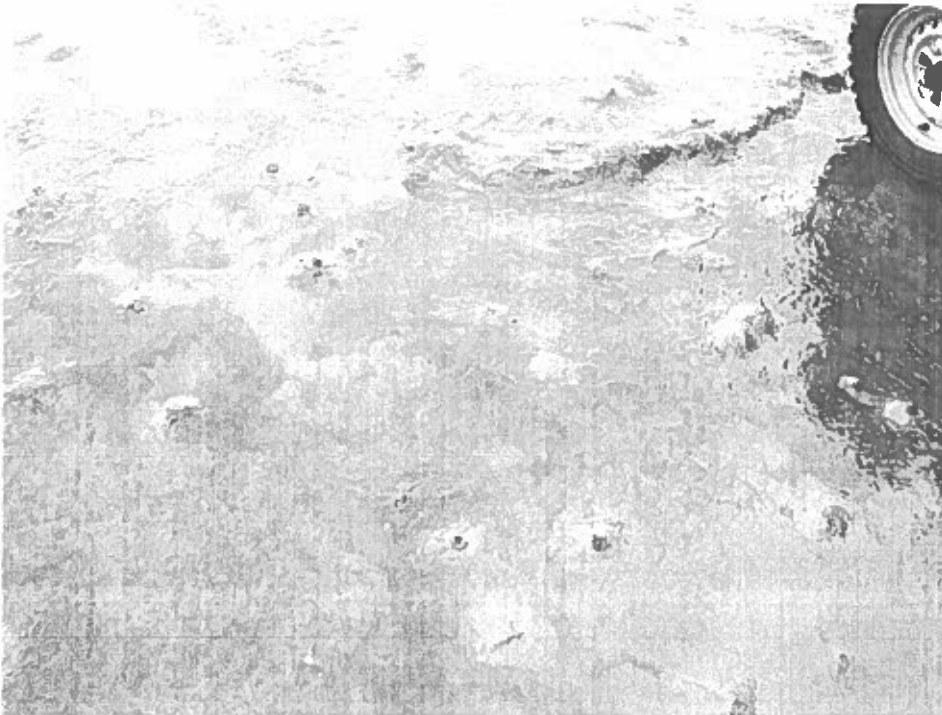


Plate 35: *Zostera noltii* and *Enteromorpha* spp. in Dundrum Bay. (DUN 22 100 CU.JPG)

Site: - Belfast Lough

Grid Reference: J412838

Survey Date: 29/09/2003

Site Description: - Belfast Lough sits at the mouth of the Lagan river and is the major harbour for Northern Ireland. Extensive land reclamation has been pursued around the Lough and shores consist of firm sediments and exposed rock.

Survey Coverage: - Only the northern eastern shore of Belfast Lough was covered due to time constraints. The south western shore still needs to be surveyed.

Bed Description: - No seagrasses of any species were observed on the N.E. shore of Belfast Lough.

Threats: - Not applicable.

Site: - Carlingford Lough.**Grid Reference:** J241136**Survey Dates:** 22/09/2003 and 24/09/2003

Site Description: - Carlingford Lough is situated on the south coast of Co. Down. Within the Lough Mill Bay is a relatively sheltered bay of firm muds. The southern shore of Carlingford Lough is in the Republic of Ireland and the Lough in total is $\approx 34 \text{ km}^2$.

Survey Coverage: - Though it was not possible to walk all the shore of Carlingford Lough, extensive areas were covered. Mill Bay was extensively surveyed and other likely areas were inspected at a distance. One transect taken (Appendices 11a–b).

Bed Description: - The only *Zostera* spp. found in Carlingford Lough on the Northern Ireland side were relatively small patches of *Zostera noltii* in the area of Mill Bay, though it is possible that some small isolated beds of *Zostera* occur elsewhere. Both *Zostera noltii* and *Z. marina* var. *angustifolia* are known to occur on the Republic of Ireland side of the Lough (A. Portig, pers. obs.). Bed C, the largest patch (4.8 ha) was relatively uniform in the upper parts with patchy distribution in lower reaches. *Enteromorpha* spp. was abundant at this site and many of the patches are small and isolated. Some drift of subtidal *Zostera marina* was found at this site and at Cranfield Point, indicating that subtidal beds are present in Carlingford Lough (A. Portig, pers. obs.; J. Preston, pers. comm.). One transect taken (Appendices 11a-b).

Threats: - Extensive evidence of vehicle tracks was noted at this site, especially along the top of Bed C. *Enteromorpha* spp. was also abundant at this site (Plate 36). *Spartina* was also abundant at this site with many small patches occurring around the bay and spread of these would severely impact the existing small beds as these occur in similar areas high on the shore (Plate 37).

Figure 20: Distribution of *Zostera* beds and transect positions, Carlingford Lough.

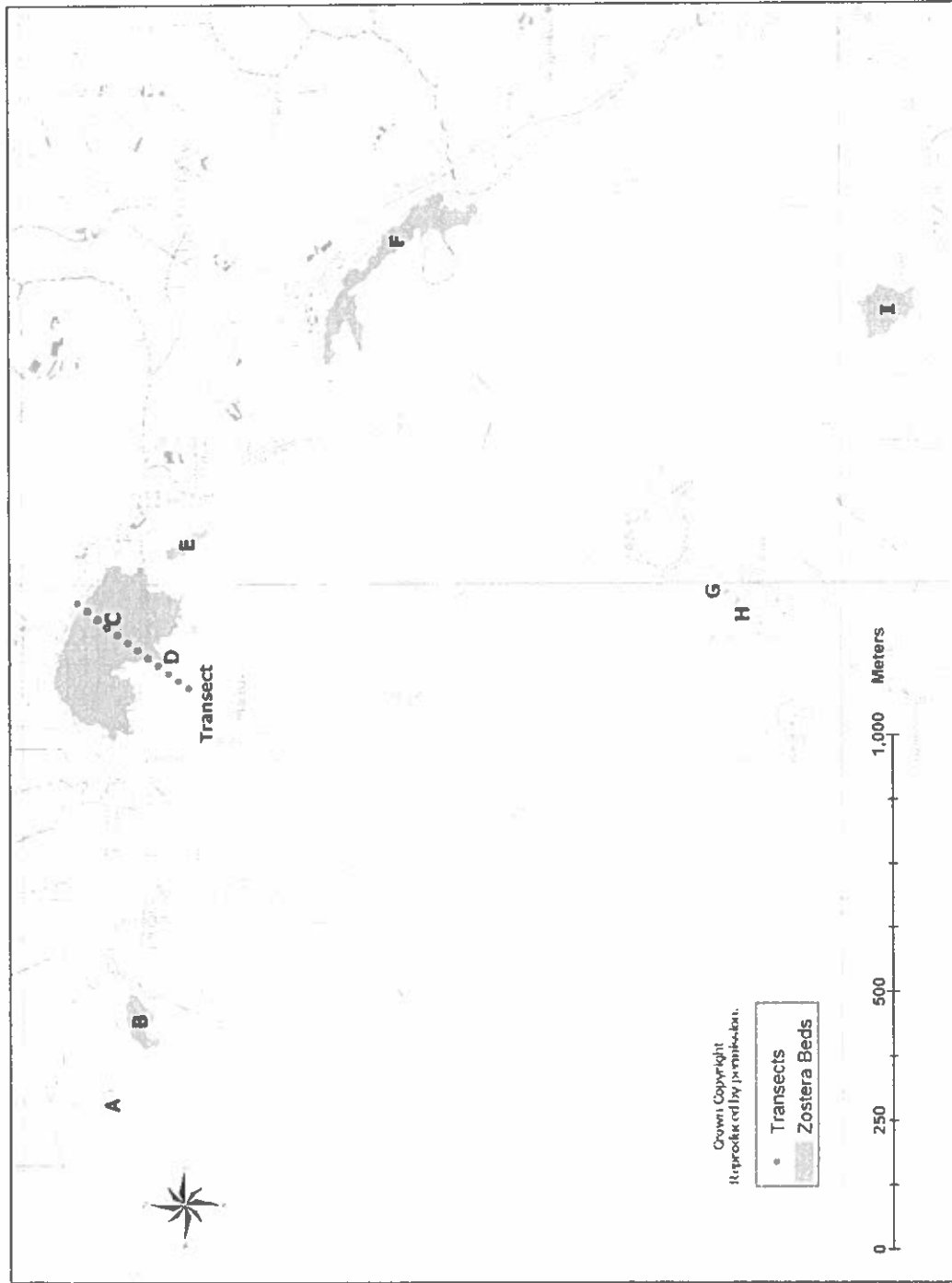




Plate 36: *Enteromorpha* spp. in Carlingford Lough. (CARL A 250 WA.JPG).

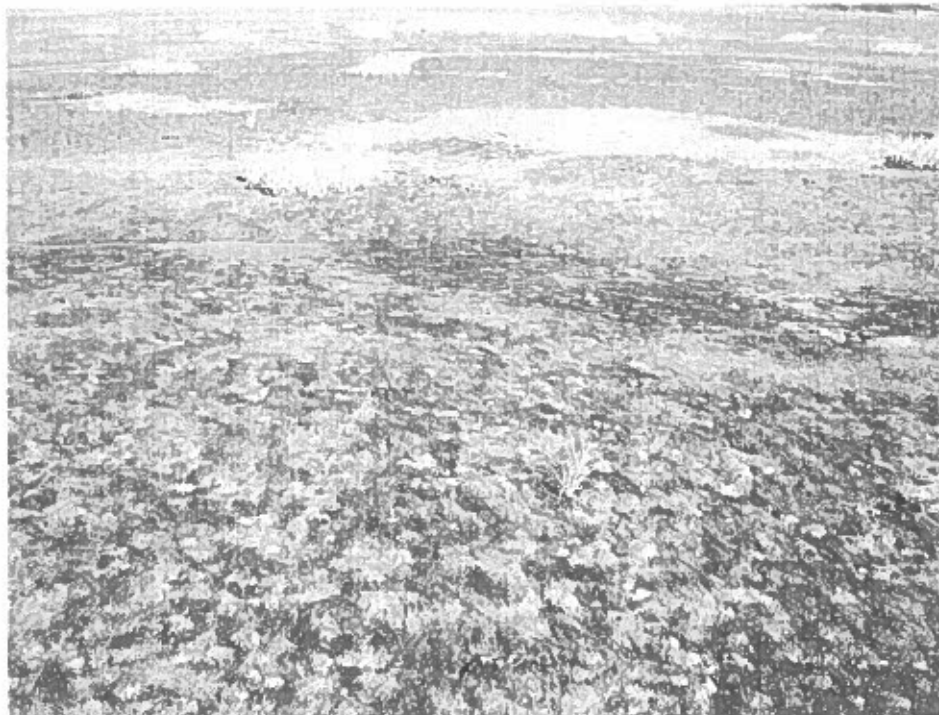


Plate 37: *Spartina* growing in bed I in Carlingford Lough. (Bed I WA1.JPG).

Site: - Killough

Grid Reference: J541368

Survey Date: 23/09/2003

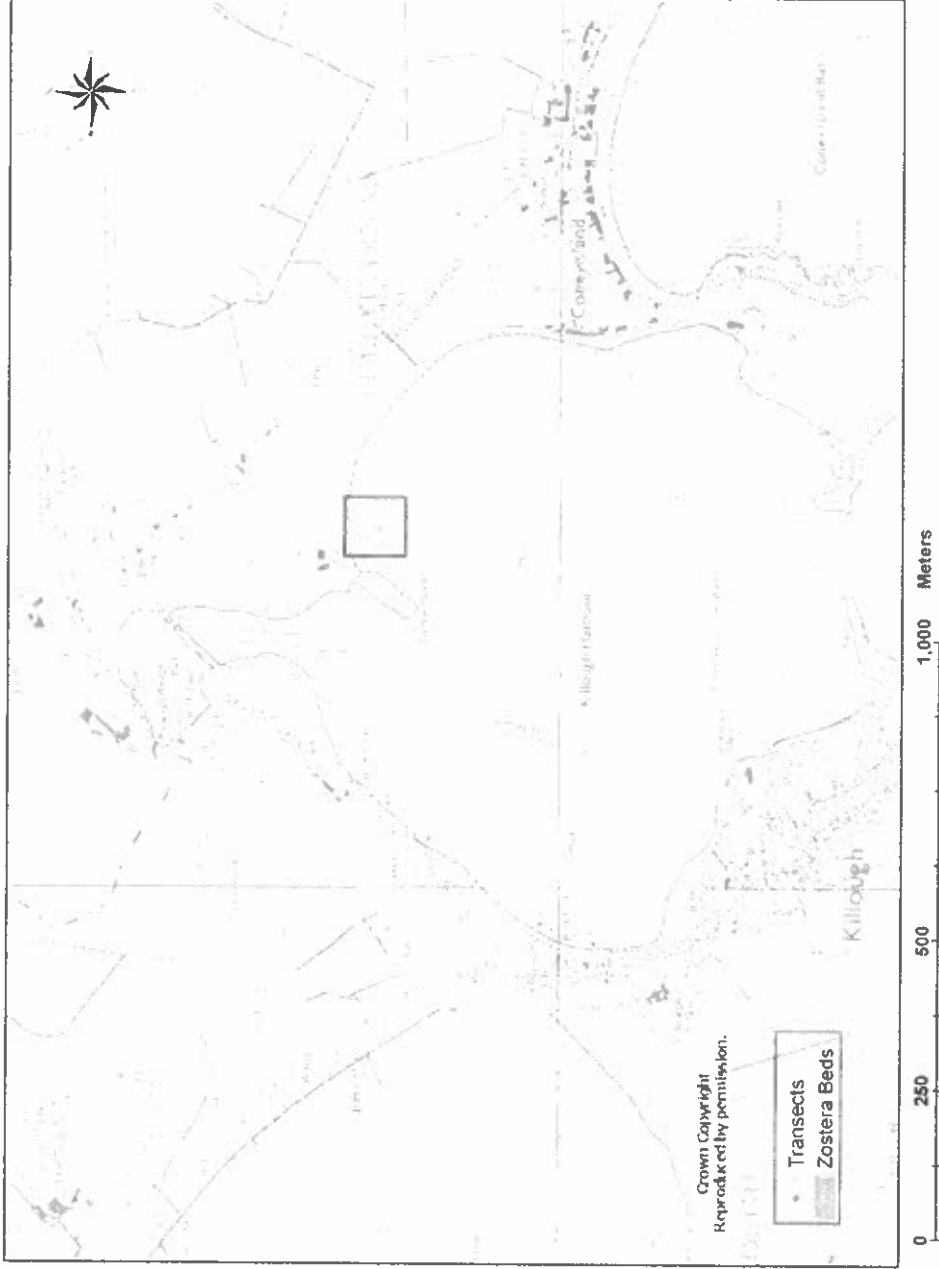
Site Description: - Killough is a small harbour (approx 1km²) on the south coast of Co. Down. The bay consists chiefly of firm sandy sediments.

Survey Coverage: - Killough was extensively surveyed, though it is possible some other very small patches may be present.

Bed Description: - *Zostera noltii* occurs in this bay in only two very small low density patches. No biomass samples were taken, as this would affect all that was present. Cover was low <10% (Plate 38 & 39).

Threats: - The general condition of this harbour was considered to be poor with a scum present on much of the intertidal vegetation that was present. *Enteromorpha* spp. was also abundant.

Figure 21: Distribution of *Zostera* beds Killlough.



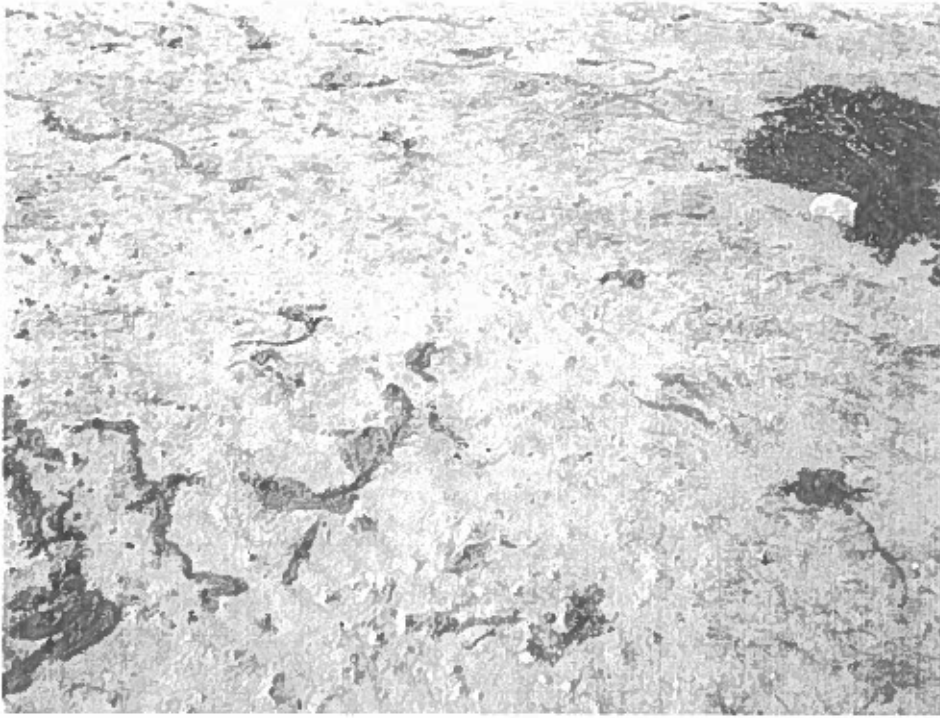


Plate 38: Low density *Zostera noltii* at Killough Harbour. (Killough *Zostera* 2003a.JPG).

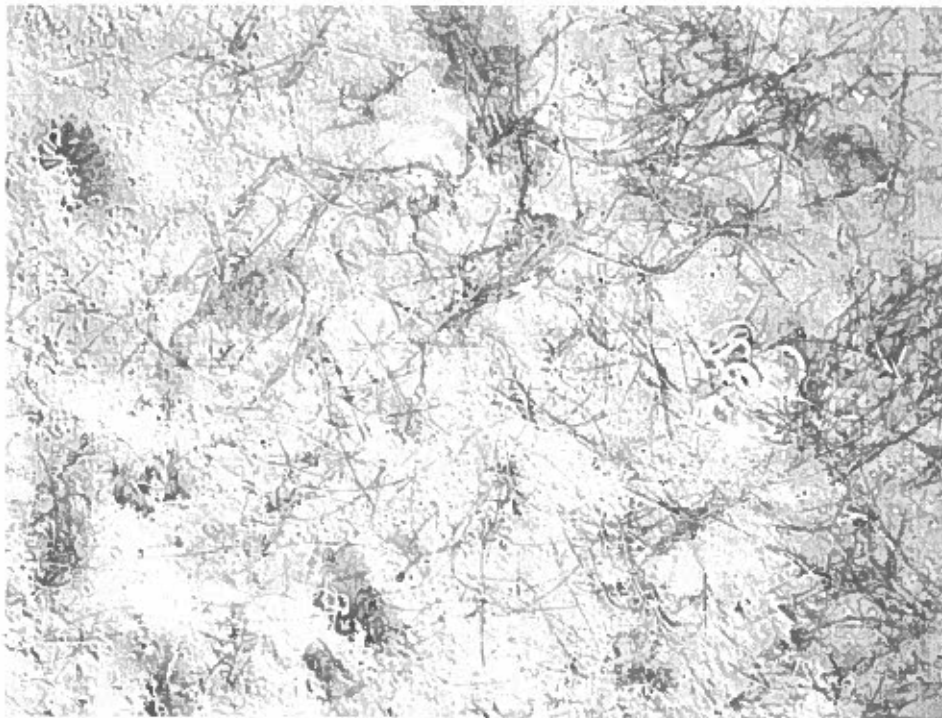


Plate 39: Low density *Zostera noltii* at Killough Harbour. (Killough *Zostera* 2003b.JPG).

Site: - Larne Lough

Grid Reference: J455975

Survey Dates: 10/07/2003 & 08/10/2003

Site Description: - Larne Lough is an enclosed inlet on the east coast of Co. Antrim formed by the peninsula of Island Magee. Sediments are chiefly soft muds.

Survey Coverage: - Coverage of Larne is not considered complete. Two areas were surveyed in detail, though survey period was considered too late. This site needs to be revisited.

Bed Description: - *Zostera* spp were observed in Larne Lough to the north of Tommy Hill's Point. However due to the late time of year this visit *Zostera* spp. found were much senescent. As a result, accurate mapping could not be done, though *Zostera noltii* and *Ruppia maritima* were believed to be the most abundant species in this bay. The bed did appear to have a considerable component of *Ruppia* spp., though due to the late survey period, this needs to be confirmed. An estimate of the likely cover was made but delineation is poor. Other areas of the estuary may contain *Zostera* spp. An earlier preliminary visit to Larne Lough found no *Zostera* present at Kilcoan More (Grid Ref J455985).

Threats: - *Enteromorpha* spp. was abundant at this site. High levels of bait digging were apparent at this site, especially on the west coast in the region of Glynn (J415995) (Plate 40).

Figure 22: Distribution of *Zostera* beds Larne Lough.

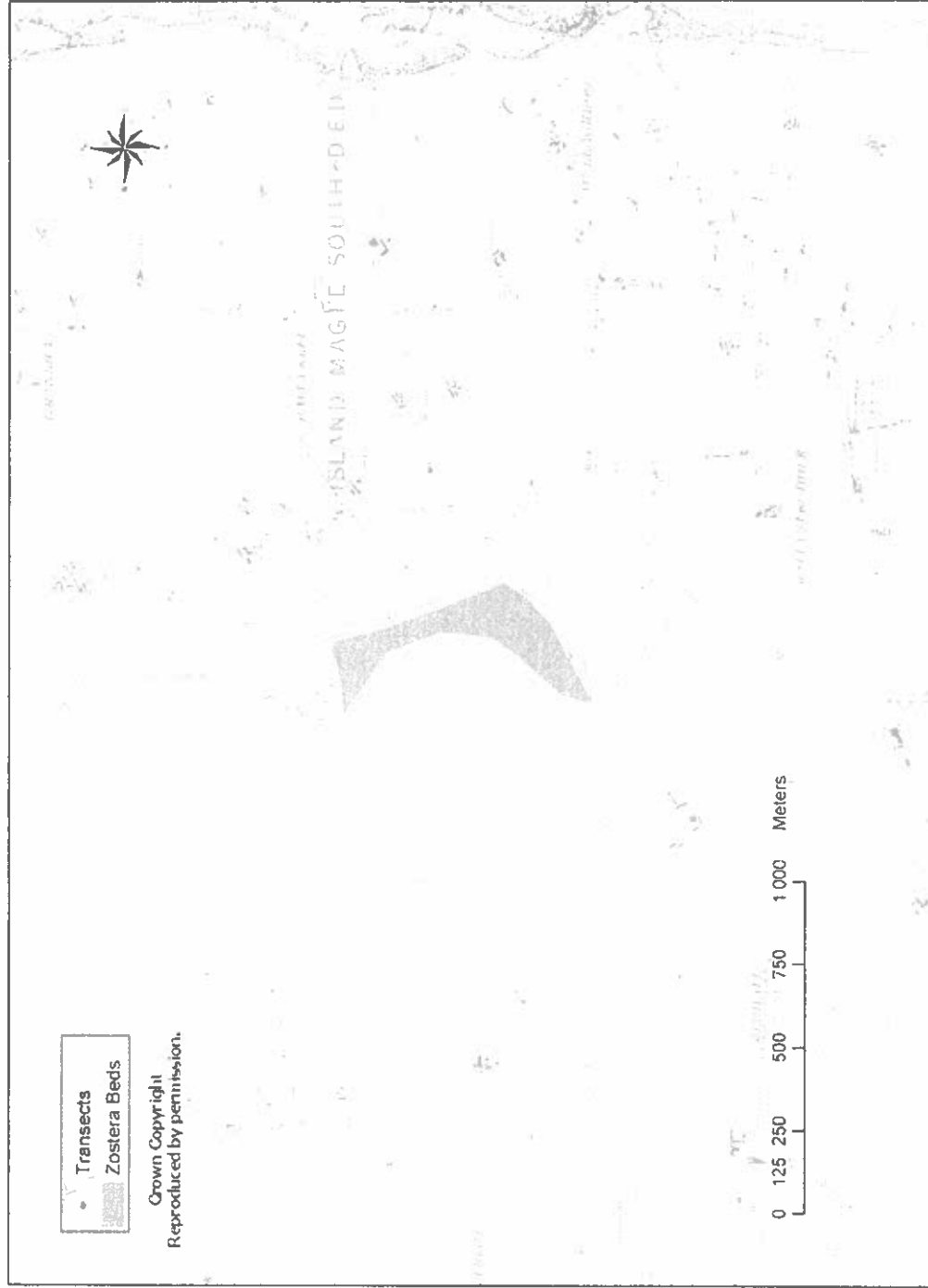




Plate 40: Bait digging Larne Lough (hummocks). (Bait Digging Larne Lough.JPG).

Results (continued)

Historical Distribution

There are few historical details of the distribution and abundance of *Zostera* spp. in Northern Ireland. During a littoral survey of vegetation of the shores of Northern Ireland in the early 1930s, Lynn (1937) produced a wealth of information on the distribution of *Zostera* spp. for a large number of sites in Northern Ireland. She also produced a more detailed description for Strangford Lough in response to the "wasting disease" that occurred in *Z. marina* at this time (Lynn, 1936). "Wasting disease" affected both the American and European seaboard of the Atlantic (Huntsman 1932; Butcher 1934) and manifested itself in the large scale loss of beds of *Z. marina*. What Lynn's work showed was that *Zostera* spp. in the 1930's were widespread in coastal areas of Northern Ireland especially in the estuaries; occurring in Larne Lough, Belfast Lough, Strangford Lough, Killough (Lough Foyle, Dundrum and Carlingford were not surveyed). She described *Zostera marina* as the dominant species though *Z. marina* var. *angustifolia* and *Zostera noltii* did occur they were not considered abundant. No other comprehensive work on Northern Ireland as a whole could be identified and any subsequent reports have been site specific and are referred to in the appropriate site section.

Strangford Lough

The distribution of *Zostera* species on Strangford Lough was first described by Lynn (1937). Subsequently, *Zostera* distribution was not mapped until 1970 by Bleakley (1971), in 1980 by Corbett (1980) and in the early 1990s by Portig (1997). All these studies used different mapping methodology, reflecting the nature of the study and changing technological capability. Comparison across these surveys should be approached with caution. Even allowing for this, it is clear that there have been gross changes in the distribution and abundance of *Zostera* over the last 70+ years. From 1970 to the early 1990s there appears to have been a reduction in extent of *Zostera* spp. to approximately 30% of the 1970s' distribution (A. Portig, unpubl. data). Species composition has also changed between the 1930s and 1970; *Z. marina* is no longer the dominant species and is now rare in the intertidal whereas *Z. noltii* is abundant along with *Z. marina* var. *angustifolia*, which may be an annual form of *Zostera marina*. The constriction in distribution of *Zostera* beds is apparent from the lower reaches of the intertidal, in addition to the complete disappearance from the more southern bays and

inlets of the Lough, such as Whiterock Bay (J523622). Since the mid-1990s there have been changes in the distribution of *Zostera* in Strangford Lough; though details are few, biomass and extent of *Zostera* spp. have increased in a limited number of sites. This is especially apparent at the North End of the Lough with an increase in biomass and a much more even distribution in biomass coupled with a limited expansion of range (A. Portig, unpubl. data; Portig *et al.* 2004). Whether this is a Lough wide or localised phenomenon is not known.

Lough Foyle.

No historical information on the distribution of *Zostera* spp. on Lough Foyle was found prior to 1991 when the beds were mapped by Richard Nairn (Natura Environmental Consultants, 2003). At this time there was an estimated 400 ha of *Zostera* spp. present in Lough Foyle. The RSPB have subsequently mapped *Zostera* spp. in Lough Foyle in 1994 and 1999. Their report does not estimate the area of coverage but observed that there was a generally similar distribution in 1994 to 1999 and that there were many changes to the range and density of growth. Comparisons between 1990 and the RSPB surveys indicate a similar distribution. As reported by the RSPB, there was an expansion of *Z. noltii* to the north of the Roe estuary towards Magilligan Point. The major difference between these surveys and the current investigation has been the loss of *Zostera* spp. from the stretch along the Ballykelly Levels (Grid Ref C622250). From the limited information available, there appears to have been a loss in coverage of approx. 190 ha since 1990. This figure should be treated with caution as different mapping methods were used, however it does appear as though there has been a major loss of *Zostera* in Lough Foyle.

Dundrum Bay.

No historical records of the distribution of *Zostera* spp. were found for Dundrum Bay, though *Zostera* spp. were known to be present in this area in the early 1990s (A. Portig, pers. obs.; W. I. Montgomery, pers. comm.).

Belfast Lough

Historical records of the distribution of *Zostera* spp. were reported by Lynn in the mid 1930s (Lynn 1937). These beds are no longer present as the mudflats they occurred on have been reclaimed.

Carlingford Lough

No historical information on the distribution of *Zostera* spp. was found for this site, though *Zostera* spp. were observed at this site in the early 1990s (A. Portig, pers. obs.)

Killough Harbour

Lynn mapped the distribution of *Zostera* spp. in the mid 1930s (Lynn, 1937). *Z. marina* was widespread, though growth in recent years had been sparse. In contrast, only *Z. noltii* was found in the present survey, though *Z. marina* var. *angustifolia* has been observed in the recent past (A. Portig, pers. obs.). It is clear that not only has *Z. marina* var. *angustifolia* been lost since the early 1990s, *Z. noltii* has also declined in this bay.

Larne Lough

The distribution of *Zostera* spp. in Larne Lough was mapped in the mid 1930s by Lynn (1937). This indicated that *Zostera* spp. were common in the Lough, especially east of Magheramore and both *Zostera marina* and *Z. marina* var. *angustifolia* were present. Although no detailed mapping was carried out in the present study it would appear that *Zostera* beds have declined since the 1930s.

Discussion

Northern Ireland's sea loughs contain significant areas of seagrasses (≈ 1156 ha). This survey has provided a baseline against which to monitor future change in this important habitat. While historical data are scarce, there has clearly been a marked decline in the distribution of seagrasses in Northern Ireland since the 1930s. This has been coupled with a change in the dominant *Zostera* spp. present in the intertidal areas with *Zostera marina* (in its perennial form) dominant in the 1930's being replaced by *Zostera noltii* and *Z. marina* var. *angustifolia* by 1970. The reasons for this change are not known and may have at least in part been triggered by the "wasting disease" that occurred during the 1930s. The natural situation within Northern Ireland's sea loughs would be dominance by *Zostera marina* and why the species has not recovered in the intertidal is unknown. More recently, patterns of change in distribution and abundance appear to vary within and among loughs. For example, there has been a general improvement in the status of *Zostera* spp. in the northern end of Strangford Lough during the last 10 years. In contrast, Lough Foyle has shown a contraction in distribution over the same period. The necessary data are lacking, however, to determine whether these changes are part of ongoing cyclical processes or longer term changes.

It is clear that *Zostera* spp. are dynamic in their distribution and abundance. A variety of natural and anthropogenic factors influence the status of seagrass beds at a range of spatial and temporal scales. Unfortunately the factors likely to determine growth or constriction of seagrass beds in Irish sea loughs are not well described in the literature.

More immediate factors leading to the local decline of seagrass beds were readily identified during this survey. These stem principally from physical damage, from trampling by humans and livestock, vehicular damage and burial from bait digging and shellfish harvesting. Less obvious or temporarily absent factors may not have been recorded. Physically damaging activities result in the removal of *Zostera* spp. from an area at various spatial scales and are often long lasting as re-colonisation rates are low. The new conditions created are also likely to be unfavourable for growth of *Z. marina* var. *angustifolia*. It is therefore desirable that acute physical damage of this sort is minimised where possible, as recovery will likely be slow and at worst damage may be irreversible.

Chronic threats to the status of seagrass beds result from the processes of eutrophication and habitat invasion. Increased nutrient inputs to sea loughs are likely to

have a major role in stimulating growth of *Enteromorpha* spp. At lower densities these algae will compete with *Zostera* for light and reduce growth rates (Duarte, 1991). At high densities, algal mats deposited on *Zostera* beds lead to the death of plants due to lack of light, smothering and creation of anoxic conditions. Ultimately, control of *Enteromorpha* spp. requires a reduction of nutrients into the system at a catchment level. Therefore short term solutions to this problem may be difficult to achieve. In the medium-long term, the objective of *Enteromorpha* reduction may be realised by the implementation of the Water Framework and Nitrates Directives.

Seagrass beds and intertidal mudflats more generally are prone to invasion by *Spartina* especially in the upper levels. This species grows rapidly and stabilizes sediments to the degree that it accelerates the succession of mud flats towards salt marshes. *Spartina* invasion of an area will displace *Zostera* spp. from the upper levels of the shore. Control of *Spartina* in the intertidal zone is widely advocated for a range of reasons related to habitat protection. However, this is a challenging and potentially problematic area, because of the potential for the rapid local eradication of *Spartina* to result in additional negative impacts on *Zostera* spp..

The conservation of seagrass beds in Northern Ireland requires a combination of approaches. Precautionary measures can be taken to avoid acute damage, and longer term measures can be supported that will reduce chronic problems. Consideration can also be given to the potential restoration of seagrass beds to areas where they are currently absent. Such measures would be justified where the causes of their original extirpation were no longer in force and where natural re-colonisation was not likely to take place because of naturally low rates of growth and dispersal (Duarte & Sand-Jensen, 1990; Duarte, 1995). Restoration would not be an option where physical characteristics were not conducive to seagrass establishment. Identifying areas where conditions are right, but *Zostera* is not present, is problematic due to a limited understanding of the physical / biological parameters of our coastal estuaries. Therefore research focussed on the scope and technology for restoration would be highly valuable.

Recommendations

1. Sources of physical damage within seagrass beds should be limited as a precautionary measure. Of particular concern are bait digging and cockle harvesting within seagrass beds of Strangford Lough and Lough Foyle, vehicular damage at Lough Foyle, Carlingford Lough and Dundrum Bay and encroachment by cattle at Lough Foyle.
2. The baseline status of unmapped minor beds should be established, in order to verify their relative contribution to the resource as a whole, and the scope for improvement of their status. Certain areas of Strangford Lough (south of Kircubbin and Ogilvie) may present significant scope for increasing the representation of seagrass beds in Northern Ireland.
3. The baseline status of sub-tidal seagrass beds should be assessed since there is little functional difference in the conservation value of seagrasses in the intertidal and subtidal zones. This is particularly significant in Strangford and Carlingford Loughs.
4. The baseline status of seagrasses in the Bann Estuary, in Larne Lough and on the south-eastern shore of Belfast Lough remains to be established.
5. An evaluation of the feasibility of *Zostera* restoration should be undertaken. This should encompass a review of restoration techniques and attempts elsewhere and an experimental evaluation of restoration techniques in a variety of environments.
6. The factors affecting the distribution and growth of *Zostera* spp. should be determined by analysis of the current distribution and results of subsequent annual monitoring in relation to the physical and biological characteristics (shore profiles, nutrient levels, exposure, water clarity and sediment stability) of Northern Ireland sea loughs.
7. The taxonomy of *Zostera* spp. should be resolved since it has implications for understanding patterns of change in species distribution and will help inform restoration programmes.
8. The threat to seagrass beds posed by invasive *Spartina* should be established by targeted monitoring of *Spartina* growth in all sea loughs, but focussing on Strangford Lough, Carlingford Lough, Dundrum and Lough Foyle.

9. Experimental investigation of *Spartina* control strategies for the cost effective conservation of seagrass beds and mudflat habitats should be undertaken in conjunction with a wider consideration of *Spartina* control in Northern Ireland.
10. The threat to seagrass beds posed by *Enteromorpha* should be established by targeted monitoring of algal deposition in sea loughs.
11. Annual monitoring should be implemented for a period of 3 years in the first instance in order to measure rates of change in bed size, coverage and biomass. This should be conducted at a subsample of points within beds, stratified according to lough, bed size and apparent vulnerability. The small size of the beds in Carlingford Lough, Dundrum Bay and Killough mean that these will require comprehensive annual monitoring.
12. Longer term monitoring of the whole resource should be conducted by repeating this comprehensive survey at an appropriate interval, determined by the results of annual sampling. We estimate that this should be between 3-5 years.
13. The baseline status of seagrass beds in hazardous areas of soft sediments should be established in order to verify their relative contribution to the resource as a whole. These include areas of Strangford Lough (Armillan Bay & Mahee Bay) and Lough Foyle.

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Appendix 1b: Details of Northend (H Profile), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
H01	—	—	—	0	H012003CU / WA .JPG	
H02	—	—	E	0	H022003CU / WA .JPG	
H03	N	A	E	20	H032003CU / WA .JPG	
H04	N	A	—	40	H042003CU / WA .JPG	
H05	N	A	E	40	H052003CU / WA .JPG	
H06	N	A	—	80	H062003CU / WA .JPG	
H07	N	A	—	80	H072003CU / WA .JPG	
H08	N	A	—	80	H082003CU / WA .JPG	
H09	N	A	—	90	H092003CU / WA .JPG	
H10S	N	A	—	90	H102003CU / WA .JPG	Sampled
H11	N	A	—	90	H112003CU / WA .JPG	
H12	N	A	—	90	H122003CU / WA .JPG	
H13	N	A	—	80	H132003CU / WA .JPG	
H14	N	A	—	80	H142003CU / WA .JPG	
H15	N	A	—	80	H152003CU / WA .JPG	
H16	N	A	—	80	H162003CU / WA .JPG	
H17	N	A	—	80	H172003CU / WA .JPG	
H18	N	A	—	70	H182003CU / WA .JPG	
H19	N	A	—	70	H192003CU / WA .JPG	
H20S	N	A	—	70	H202003CU / WA .JPG	Sampled
H21	—	A	—	10	H212003CU / WA .JPG	
H22	—	A	—	10	H222003CU / WA .JPG	
H23	N	A	—	50	H232003CU / WA .JPG	
H24	N	A	—	50	H242003CU / WA .JPG	
H25	N	A	—	20	H252003CU / WA .JPG	
H26	N	A	—	30	H262003CU / WA .JPG	
H27	N	A	—	30	H272003CU / WA .JPG	
H28	N	A	—	20	H282003CU / WA .JPG	
H29	N	A	—	20	H292003CU / WA .JPG	
H30	N	A	—	<<10	H302003CU / WA .JPG	
H31	—	A	—	<<10	H312003CU / WA .JPG	
H32	—	A	—	<<10	H322003CU / WA .JPG	
H33	—	—	—	0	H332003CU / WA .JPG	
H34	—	—	—	0	H342003CU / WA .JPG	
H35	—	—	—	0	H352003CU / WA .JPG	
H36	—	—	—	0	H362003CU / WA .JPG	
H37	—	—	—	0	H372003CU / WA .JPG	
H38	—	—	—	0	H382003CU / WA .JPG	
H39	—	—	—	0	H392003CU / WA .JPG	
H40S	—	—	—	0	H402003CU / WA .JPG	
H41	—	—	—	0	H412003CU / WA .JPG	
H42	—	—	—	0	H422003CU / WA .JPG	
H43	—	—	—	0	H432003CU / WA .JPG	
H44	—	—	—	0	H442003CU / WA .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 1a: Details of Northend (D Profile), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
D01	N	—	—	20	D012003CU / WA .JPG	
D02	N	A	—	10	D022003CU / WA .JPG	
D03	N	A	—	70	D032003CU / WA .JPG	
D04	N	A	—	70	D042003CU / WA .JPG	
D05	N	A	—	60	D052003CU / WA .JPG	
D06	N	A	—	60	D062003CU / WA .JPG	
D07	N	A	—	50	D072003CU / WA .JPG	
D08	N	A	—	50	D082003CU / WA .JPG	
D09	N	A	—	60	D092003CU / WA .JPG	
D10S	N	A	—	50	D102003CU / WA .JPG	Sampled
D11	N	A	—	60	D112003CU / WA .JPG	
D12	N	A	—	60	D122003CU / WA .JPG	
D13	N	A	—	50	D132003CU / WA .JPG	
D14	N	A	—	60	D142003CU / WA .JPG	
D15	N	A	—	50	D152003CU / WA .JPG	
D16	N	A	—	50	D162003CU / WA .JPG	
D17	N	A	—	50	D172003CU / WA .JPG	
D18	N	A	—	50	D182003CU / WA .JPG	
D19	N	A	—	60	D192003CU / WA .JPG	
D20S	N	A	—	70	D202003CU / WA .JPG	Sampled
D21	N	A	—	60	D212003CU / WA .JPG	
D22	N	A	—	60	D222003CU / WA .JPG	
D23	N	A	—	50	D232003CU / WA .JPG	
D24	—	—	—	0	D242003CU / WA .JPG	
D25	—	A	—	0	D252003CU / WA .JPG	
D26	—	—	—	0	D262003CU / WA .JPG	
D27	—	A	—	0	D272003CU / WA .JPG	
D28	—	—	—	0	D282003CU / WA .JPG	
D29	—	—	—	0	D292003CU / WA .JPG	
D30S	—	A	—	<<10	D302003CU / WA .JPG	
D31	N	A	—	10	D312003CU / WA .JPG	
D32	N	A	—	20	D322003CU / WA .JPG	
D33	N	A	—	70	D332003CU / WA .JPG	
D34	N	A	—	70	D342003CU / WA .JPG	
D35	N	A	—	80	D352003CU / WA .JPG	
D36	—	—	—	0	D362003CU / WA .JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 1c: Details of Northend (M Profile), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
M02	N	A	E	50	M022003CU / WA .JPG	
M03	N	A	E	60	M032003CU / WA .JPG	
M04	N	A	E	50	M042003CU / WA .JPG	
M05	N	A	E	50	M052003CU / WA .JPG	
M06	N	A	E	20	M062003CU / WA .JPG	
M07	N	A	—	50	M072003CU / WA .JPG	
M08	N	A	—	50	M082003CU / WA .JPG	
M09	N	A	—	50	M092003CU / WA .JPG	
M10	N	A	E	60	M102003CU / WA .JPG	Sampled
M11	N	A	E	10	M112003CU / WA .JPG	
M12	—	—	E	0	M122003CU / WA .JPG	
M13	N	A	E	50	M132003CU / WA .JPG	
M14	N	A	E	10	M142003CU / WA .JPG	
M15	N	A	—	60	M152003CU / WA .JPG	
M16	N	A	E	60	M162003CU / WA .JPG	
M17	N	—	—	10	M172003CU / WA .JPG	
M18	—	—	—	0	M182003CU / WA .JPG	
M19	N	A	—	50	M192003CU / WA .JPG	
M20	N	A	—	50	M202003CU / WA .JPG	Sampled
M21	N	A	—	40	M212003CU / WA .JPG	
M22	N	A	—	20	M222003CU / WA .JPG	
M23	N	A	—	40	M232003CU / WA .JPG	
M24	N	A	—	60	M242003CU / WA .JPG	
M25	N	A	—	60	M252003CU / WA .JPG	
M26	N	A	—	60	M262003CU / WA .JPG	
M27	N	A	—	60	M272003CU / WA .JPG	
M28	N	A	E	70	M282003CU / WA .JPG	
M29	N	A	—	70	M292003CU / WA .JPG	
M30	N	A	—	50	M302003CU / WA .JPG	Sampled
M31	A	—	—	40	M312003CU / WA .JPG	
M32	A	—	—	30	M322003CU / WA .JPG	
M33	A	—	—	10	M332003CU / WA .JPG	
M34	A	—	—	<<10	M342003CU / WA .JPG	
M35	—	—	—	0	M352003CU / WA .JPG	
M36	—	—	—	0	M362003CU / WA .JPG	
M37	—	—	—	0	M372003CU / WA .JPG	
M38	—	—	—	0	M382003CU / WA .JPG	
M39	—	—	—	0	M392003CU / WA .JPG	
M40	—	—	—	0	M402003CU / WA .JPG	
M41	—	—	—	0	M412003CU / WA .JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 1d: Details for Northend (XC Profile), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
XC001	N	A	—	70	XC0012003CU / WA .JPG	
XC002	N	A	E	70	XC0022003CU / WA .JPG	
XC003	N	A	—	60	XC0032003CU / WA .JPG	
XC004	N	A	—	60	XC0042003CU / WA .JPG	
XC005	N	A	—	40	XC0052003CU / WA .JPG	
XC006	N	A	E	60	XC0062003CU / WA .JPG	
XC007	N	A	—	60	XC0072003CU / WA .JPG	
XC008	N	A	—	70	XC0082003CU / WA .JPG	
XC009	N	A	—	70	XC0092003CU / WA .JPG	
XC010	N	A	—	50	XC0102003CU / WA .JPG	Sampled
XC011	N	A	—	50	XC0112003CU / WA .JPG	
XC012	N	A	—	50	XC0122003CU / WA .JPG	
XC013	N	A	—	50	XC0132003CU / WA .JPG	
XC014	N	A	—	40	XC0142003CU / WA .JPG	
XC015	N	A	—	60	XC0152003CU / WA .JPG	
XC016	N	A	—	50	XC0162003CU / WA .JPG	
XC017	N	A	—	50	XC0172003CU / WA .JPG	
XC018	N	A	—	60	XC0182003CU / WA .JPG	
XC019	N	A	—	70	XC0192003CU / WA .JPG	
XC020	N	A	—	70	XC0202003CU / WA .JPG	Sampled
XC021	N	A	—	70	XC0212003CU / WA .JPG	
XC022	N	A	—	70	XC0222003CU / WA .JPG	
XC023	N	A	—	70	XC0232003CU / WA .JPG	
XC024	N	A	—	70	XC0242003CU / WA .JPG	
XC025	N	A	—	60	XC0252003CU / WA .JPG	
XC026	N	A	—	50	XC0262003CU / WA .JPG	
XC027	N	A	—	40	XC0272003CU / WA .JPG	
XC028	N	A	—	40	XC0282003CU / WA .JPG	
XC029	N	A	—	60	XC0292003CU / WA .JPG	
XC030	N	A	—	60	XC0302003CU / WA .JPG	Sampled
XC031	N	A	—	60	XC0312003CU / WA .JPG	
XC032	N	A	—	70	XC0322003CU / WA .JPG	
XC033	N	A	—	80	XC0332003CU / WA .JPG	
XC034	N	A	—	50	XC0342003CU / WA .JPG	
XC035	N	A	—	80	XC0352003CU / WA .JPG	
XC036	N	A	—	80	XC0362003CU / WA .JPG	
XC037	N	A	—	80	XC0372003CU / WA .JPG	
XC038	N	A	—	80	XC0382003CU / WA .JPG	
XC039	N	A	—	80	XC0392003CU / WA .JPG	
XC040	N	A	—	80	XC0402003CU / WA .JPG	Sampled
XC041	N	A	—	80	XC0412003CU / WA .JPG	
XC042	N	A	—	90	XC0422003CU / WA .JPG	
XC043	N	A	—	80	XC0432003CU / WA .JPG	
XC044	N	A	—	90	XC0442003CU / WA .JPG	
XC045	N	A	—	90	XC0452003CU / WA .JPG	
XC046	N	A	—	90	XC0462003CU / WA .JPG	
XC047	N	A	—	60	XC0472003CU / WA .JPG	
XC048	N	A	—	40	XC0482003CU / WA .JPG	
XC049	—	—	—	0	XC0492003CU / WA .JPG	

Appendix 1d Continued: Details for Northend (XC Profile), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
XC050	N	A	E	30	XC0502003CU / WA .JPG	Sampled
XC051	N	A	E	60	XC0512003CU / WA .JPG	
XC052	N	A	E	60	XC0522003CU / WA .JPG	
XC053	N	A	E	10	XC0532003CU / WA .JPG	
XC054	N	A	E	20	XC0542003CU / WA .JPG	
XC055	—	A	—	30	XC0552003CU / WA .JPG	
XC056	N	A	—	20	XC0562003CU / WA .JPG	
XC057	N	A	E	40	XC0572003CU / WA .JPG	
XC058	N	—	E	20	XC0582003CU / WA .JPG	
XC059	N	—	E	30	XC0592003CU / WA .JPG	
XC060	N	—	E	20	XC0602003CU / WA .JPG	
XC061	N	A	E	20	XC0612003CU / WA .JPG	
XC062	—	A	E	<<10	XC0622003CU / WA .JPG	
XC063	N	A	E	10	XC0632003CU / WA .JPG	
XC064	N	A	E	20	XC0642003CU / WA .JPG	
XC065	N	—	E	<<10	XC0652003CU / WA .JPG	
XC066	—	A	E	<<10	XC0662003CU / WA .JPG	
XC067	N	A	E	30	XC0672003CU / WA .JPG	
XC068	N	A	E	20	XC0682003CU / WA .JPG	
XC069	N	—	E	<<10	XC0692003CU / WA .JPG	
XC070	—	—	E	0	XC0702003CU / WA .JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 1e: Details for Northend (XF Profile), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
XF001	—	—	—	0	XF0012003CU / WA .JPG	
XF002	N	—	—	10	XF0022003CU / WA .JPG	
XF003	N	—	—	70	XF0032003CU / WA .JPG	
XF004	N	—	—	70	XF0042003CU / WA .JPG	
XF005	N	—	E	90	XF0052003CU / WA .JPG	
XF006	—	—	—	0	XF0062003CU / WA .JPG	
XF007	N	—	E	70	XF0072003CU / WA .JPG	
XF008	N	A	—	20	XF0082003CU / WA .JPG	
XF009	N	A	—	80	XF0092003CU / WA .JPG	Sampled
XF010	N	A	—	20	XF0102003CU / WA .JPG	
XF011	N	A	—	60	XF0112003CU / WA .JPG	
XF012	N	A	—	20	XF0122003CU / WA .JPG	
XF013	N	A	—	60	XF0132003CU / WA .JPG	
XF014	N	A	—	70	XF0142003CU / WA .JPG	
XF015	N	A	—	70	XF0152003CU / WA .JPG	
XF016	N	A	—	80	XF0162003CU / WA .JPG	
XF017	N	A	—	60	XF0172003CU / WA .JPG	
XF018	N	A	—	70	XF0182003CU / WA .JPG	
XF019	N	A	—	70	XF0192003CU / WA .JPG	
XF020	N	A	—	80	XF0202003CU / WA .JPG	Sampled
XF021	N	A	—	80	XF0212003CU / WA .JPG	
XF022	N	A	—	80	XF0222003CU / WA .JPG	
XF023	N	A	—	80	XF0232003CU / WA .JPG	
XF024	N	A	—	70	XF0242003CU / WA .JPG	
XF025	N	A	—	70	XF0252003CU / WA .JPG	
XF026	N	A	—	70	XF0262003CU / WA .JPG	
XF027	N	A	—	60	XF0272003CU / WA .JPG	
XF028	—	—	—	0	XF0282003CU / WA .JPG	
XF029	—	A	—	<<10	XF0292003CU / WA .JPG	
XF030	—	A	—	20	XF0302003CU / WA .JPG	
XF031	N	A	—	70	XF0312003CU / WA .JPG	
XF032	N	A	—	50	XF0322003CU / WA .JPG	Sampled
XF033	N	A	—	50	XF0332003CU / WA .JPG	
XF034	N	A	—	40	XF0342003CU / WA .JPG	
XF035	N	A	—	30	XF0352003CU / WA .JPG	
XF036	N	A	—	30	XF0362003CU / WA .JPG	
XF037	N	A	—	30	XF0372003CU / WA .JPG	
XF038	N	A	—	20	XF0382003CU / WA .JPG	
XF039	N	A	—	20	XF0392003CU / WA .JPG	
XF040	N	A	—	10	XF0402003CU / WA .JPG	Sampled
XF041	N	A	—	10	XF0412003CU / WA .JPG	
XF042	N	A	—	10	XF0422003CU / WA .JPG	
XF043	N	A	—	10	XF0432003CU / WA .JPG	
XF044	—	A	—	10	XF0442003CU / WA .JPG	
XF045	—	—	—	0	XF0452003CU / WA .JPG	

Appendix 1e Continued: Details for Northend (XF Profile), Strangford Lough

XF046	—	—	—	0	XF0462003CU / WA .JPG	
XF047	—	A	—	30	XF0472003CU / WA .JPG	
XF048	N	A	—	30	XF0482003CU / WA .JPG	
XF049	N	A	—	30	XF0492003CU / WA .JPG	
XF050	N	A	—	20	XF0502003CU / WA .JPG	Sampled
XF051	—	A	—	10	XF0512003CU / WA .JPG	
XF052	N	A	—	20	XF0522003CU / WA .JPG	
XF053	—	A	—	20	XF0532003CU / WA .JPG	
XF054	—	A	—	40	XF0542003CU / WA .JPG	
XF055	—	A	—	50	XF0552003CU / WA .JPG	
XF056	—	A	—	60	XF0562003CU / WA .JPG	
XF057	—	A	—	60	XF0572003CU / WA .JPG	
XF058	—	A	—	50	XF0582003CU / WA .JPG	
XF059	—	A	—	50	XF0592003CU / WA .JPG	
XF060	N	A	—	60	XF0602003CU / WA .JPG	Sampled
XF061	N	A	—	60	XF0612003CU / WA .JPG	
XF062	N	A	—	40	XF0622003CU / WA .JPG	
XF063	—	A	—	10	XF0632003CU / WA .JPG	
XF064	—	A	—	20	XF0642003CU / WA .JPG	
XF065	N	A	E	50	XF0652003CU / WA .JPG	
XF066	N	A	—	60	XF0662003CU / WA .JPG	
XF067	N	A	—	60	XF0672003CU / WA .JPG	
XF068	N	A	E	40	XF0682003CU / WA .JPG	
XF069	N	A	—	50	XF0692003CU / WA .JPG	
XF070	N	A	—	60	XF0702003CU / WA .JPG	Sampled
XF071	N	A	—	10	XF0712003CU / WA .JPG	
XF072	N	A	E	40	XF0722003CU / WA .JPG	
XF073	N	A	E	30	XF0732003CU / WA .JPG	
XF074	—	—	—		XF0742003CU / WA .JPG	
XF075	N	—	E	40	XF0752003CU / WA .JPG	
XF076	N	—	E	50	XF0762003CU / WA .JPG	
XF077	—	—	—	10	XF0772003CU / WA .JPG	
XF078	N	—	E	10	XF0782003CU / WA .JPG	
XF079	N	—	E	10	XF0792003CU / WA .JPG	
XF080	N	—	E	10	XF0802003CU / WA .JPG	
XF081	N	—	E	10	XF0812003CU / WA .JPG	
XF082	—	—	—	0	XF0822003CU / WA .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 1f: Biomass details for Northend, Strangford Lough

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
D10	43.1	4.6	22.7	9.7	65.8	14.2
D20	60.8	11.1	33.4	2.2	94.2	13.3
H10	80.8	9.5	32.2	4.9	113.0	5.5
H20	159.8	82.3	26.9	11.2	186.7	93.4
M10	68.4	12.8	23.6	5.4	92.1	17.6
M20	39.6	7.9	26.1	2.3	65.7	10.3
M30	35.2	20.8	5.3	1.4	40.6	21.9
XC10	43.6	2.5	18.4	2.8	62.0	3.6
XC20	33.3	8.3	19.6	6.0	52.9	3.8
XC30	46.5	5.5	18.1	6.3	64.6	9.7
XC40	47.2	14.6	19.4	7.4	66.6	22.0
XC50	29.9	6.7	30.9	6.3	60.8	11.2
XF009	63.0	13.9	35.3	6.8	98.3	12.3
XF020	87.1	7.0	43.1	3.6	130.2	5.3
XF032	15.1	7.6	2.9	1.6	18.0	9.0
XF040	13.5	11.8	1.3	1.0	14.8	12.8
XF050	7.1	3.9	1.9	1.1	8.9	5.0
XF060	46.8	8.5	11.6	5.9	58.3	5.8
XF070	17.9	5.7	24.4	3.2	42.2	8.3

Appendix 2a: Details of Chapel (Transect A), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Chapel A 000	—	—	—	0	Chapel A 000 CU / WA .JPG	
Chapel A 050	N	—	—	30	Chapel A 050 CU / WA .JPG	
Chapel A 100	N	A	—	70	Chapel A 100 CU / WA .JPG	
Chapel A 150	N	A	—	70	Chapel A 150 CU / WA .JPG	
Chapel A 200	N	—	—	70	Chapel A 200 CU / WA .JPG	Sampled
Chapel A 250	N	A	—	70	Chapel A 250 CU / WA .JPG	
Chapel A 300	N	—	—	30	Chapel A 300 CU / WA .JPG	
Chapel A 350	—	—	—	0	Chapel A 350 CU / WA .JPG	

N = Presence of *Zostera noltii*
 A = Presence of *Zostera angustifolia*
 E = Presence of *Enteromorpha* spp.
 % = Estimate of *Zostera* spp. Cover

Appendix 2b: Details for Chapel (Transect B), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Chapel B 000	N	—	—	30	Chapel B 000 CU / WA .JPG	
Chapel B 050	N	—	—	50	Chapel B 050 CU / WA .JPG	
Chapel B 100	N	A	—	70	Chapel B 100 CU / WA .JPG	
Chapel B 150	N	A	—	70	Chapel B 150 CU / WA .JPG	
Chapel B 200	N	A	—	70	Chapel B 200 CU / WA .JPG	Sampled
Chapel B 250	N	A	—	70	Chapel B 250 CU / WA .JPG	
Chapel B 300	N	A	—	80	Chapel B 300 CU / WA .JPG	
Chapel B 350	N	A	—	80	Chapel B 350 CU / WA .JPG	
Chapel B 400	N	A	—	80	Chapel B 400 CU / WA .JPG	
Chapel B 450	N	A	—	70	Chapel B 450 CU / WA .JPG	Sampled
Chapel B 500	—	—	—	0	Chapel B 500 CU / WA .JPG	
Chapel B 550	—	—	—	0	Chapel B 550 CU / WA .JPG	

N = Presence of *Zostera noltii*
 A = Presence of *Zostera angustifolia*
 E = Presence of *Enteromorpha* spp.
 % = Estimate of *Zostera* spp. Cover

Appendix 2c: Details for Chapel (Transect C), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Chapel C 000	—	—	—	0	Chapel C 000CU / WA .JPG	
Chapel C 050	N	—	—	20	Chapel C 050CU / WA .JPG	
Chapel C 100	N	—	—	20	Chapel C 100CU / WA .JPG	
Chapel C 150	N	—	—	40	Chapel C 150CU / WA .JPG	
Chapel C 200	N	—	—	60	Chapel C 200CU / WA .JPG	Sampled
Chapel C 250	N	—	—	60	Chapel C 250CU / WA .JPG	
Chapel C 300	N	A	—	70	Chapel C 300CU / WA .JPG	
Chapel C 350	N	A	—	60	Chapel C 350CU / WA .JPG	
Chapel C 400	N	A	—	70	Chapel C 400CU / WA .JPG	
Chapel C 450	N	A	—	70	Chapel C 450CU / WA .JPG	Sampled
Chapel C 500	N	A	—	80	Chapel C 500CU / WA .JPG	
Chapel C 550	N	A	—	80	Chapel C 550CU / WA .JPG	
Chapel C 600	N	A	—	70	Chapel C 600CU / WA .JPG	
Chapel C 650	N	A	—	70	Chapel C 650CU / WA .JPG	
Chapel C 700	N	A	—	70	Chapel C 700CU / WA .JPG	Sampled
Chapel C 750	N	A	—	70	Chapel C 750CU / WA .JPG	
Chapel C 800	N	A	—	40	Chapel C 800CU / WA .JPG	
Chapel C 850	N	A	—	60	Chapel C 850CU / WA .JPG	
Chapel C 900	N	A	—	70	Chapel C 900CU / WA .JPG	
Chapel C 950	N	—	—	60	Chapel C 950CU / WA .JPG	Sampled
Chapel C 1000	N	A	—	70	Chapel C 1000CU / WA .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 2d: Details for Chapel (Transect D), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Chapel D 000	N	A		80	Chapel D 000CU/WA.JPG	
Chapel D 100	N	A		80	Chapel D 100CU/WA.JPG	
Chapel D 200	N	A		70	Chapel D 200CU/WA.JPG	
Chapel D 300	N	A		70	Chapel D 300CU/WA.JPG	
Chapel D 400	N	A		80	Chapel D 400CU/WA.JPG	
Chapel D 500	N	A		60	Chapel D 500CU/WA.JPG	
Chapel D 600	N	A		60	Chapel D 600CU/WA.JPG	
Chapel D 700	N	A		60	Chapel D 700CU/WA.JPG	
Chapel D 800	N	A		70	Chapel D 800CU/WA.JPG	
Chapel D 900				0	Chapel D 900CU/WA.JPG	
Chapel D 1000	N	A		70	Chapel D 1000CU/WA.JPG	
Chapel D 1100	N			10	Chapel D 1100CU/WA.JPG	
Chapel D 1200	N			20	Chapel D 1200CU/WA.JPG	
Chapel D 1300	N			60	Chapel D 1300CU/WA.JPG	
Chapel D 1400	N			60	Chapel D 1400CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 2e: Biomass details for Chapel Island (SL), Strangford Lough

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
Chapel A 200	28.6	1.6	45.5	5.4	74.1	3.9
Chapel B 200	47.5	6.9	109.6	7.3	157.1	13.9
Chapel B 450	27.6	3.2	40.7	3.8	68.3	2.0
Chapel C 200	33.7	8.0	31.0	3.2	64.7	11.1
Chapel C 450	20.0	5.2	33.7	4.2	53.7	8.4
Chapel C 700	41.2	11.3	29.7	2.0	70.8	13.2
Chapel C 950	15.1	5.1	34.3	4.1	49.4	1.9

Appendix 3a: Details for Castle Espie (Transect A), Strangford Lough

Sample Point	N	A	E	%	Photo Label	Sampled
Castle Espie A000	—	—	—	0	CE A 000 WA / CU .JPG	
Castle Espie A050	N	—	E	70	CE A 050 WA / CU .JPG	
Castle Espie A100	N	—	E	80	CE A 100 WA / CU .JPG	
Castle Espie A150	N	—	E	70	CE A 150 WA / CU .JPG	
Castle Espie A200	N	A	—	70	CE A 200 WA / CU .JPG	Sampled
Castle Espie A250	N	—	—	40	CE A 250 WA / CU .JPG	
Castle Espie A300	N	A	—	70	CE A 300 WA / CU .JPG	
Castle Espie A350	N	A	—	60	CE A 350 WA / CU .JPG	
Castle Espie A400	N	—	—	40	CE A 400 WA / CU .JPG	
Castle Espie A450	N	A	—	60	CE A 450 WA / CU .JPG	Sampled
Castle Espie A500	N	A	—	70	CE A 500 WA / CU .JPG	
Castle Espie A550	N	A	—	80	CE A 550 WA / CU .JPG	
Castle Espie A600	N	A	—	80	CE A 600 WA / CU .JPG	
Castle Espie A650	N	A	—	80	CE A 650 WA / CU .JPG	
Castle Espie A700	N	—	—	90	CE A 700 WA / CU .JPG	Sampled
Castle Espie A750	—	—	E	0	CE A 750 WA / CU .JPG	
Castle Espie A800	—	—	—	0	CE A 800 WA / CU .JPG	
Castle Espie A850	—	—	—	0	CE A 850 WA / CU .JPG	
Castle Espie A900	—	—	—	0	CE A 900 WA / CU .JPG	
Castle Espie A950	—	—	—	0	CE A 950 WA / CU .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 3b: Details for Castle Espie (Transect B), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Castle Espie B000	—	—	—	0	CE B 000 CU / WA .JPG	
Castle Espie B050	N	—	—	70	CE B 050 CU / WA .JPG	
Castle Espie B100	N	—	—	60	CE B 100 CU / WA .JPG	
Castle Espie B150	N	A	—	60	CE B 150 CU / WA .JPG	
Castle Espie B200	N	A	—	60	CE B 200 CU / WA .JPG	
Castle Espie B250	N	—	—	40	CE B 250 CU / WA .JPG	Sampled
Castle Espie B300	—	—	—	0	CE B 300 CU / WA .JPG	
Castle Espie B350	N	A	—	70	CE B 350 CU / WA .JPG	
Castle Espie B400	N	A	—	70	CE B 400 CU / WA .JPG	
Castle Espie B450	N	A	—	70	CE B 450 CU / WA .JPG	
Castle Espie B500	N	A	—	70	CE B 500 CU / WA .JPG	Sampled
Castle Espie B550	N	A	—	70	CE B 550 CU / WA .JPG	
Castle Espie B600	N	A	—	70	CE B 600 CU / WA .JPG	
Castle Espie B650	N	A	—	70	CE B 650 CU / WA .JPG	
Castle Espie B700	N	A	—	70	CE B 700 CU / WA .JPG	
Castle Espie B750	N	A	—	70	CE B 750 CU / WA .JPG	Sampled
Castle Espie B800	N	A	—	60	CE B 800 CU / WA .JPG	
Castle Espie B850	N	A	—	50	CE B 850 CU / WA .JPG	
Castle Espie B900	—	—	—	0	CE B 900 CU / WA .JPG	
Castle Espie B950	—	—	—	0	CE B 950 CU / WA .JPG	
Castle Espie B1000	—	—	—	0	CE B 1000 CU / WA .JPG	
Castle Espie B1050	—	—	—	0	CE B 1050 CU / WA .JPG	
Castle Espie B1100	—	—	—	0	CE B 1100 CU / WA .JPG	
Castle Espie B1150	—	—	—	0	CE B 1150 CU / WA .JPG	
Castle Espie B1200	—	—	—	0	CE B 1200 CU / WA .JPG	
Castle Espie B1250	—	—	—	0	CE B 1250 CU / WA .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 3c: Details for Castle Espie (Transect C), Strangford Lough

Sample Point	N	A	E	%	Photo Label	Sampled
Castle Espie C000	—	—	—	0	CE C 000 CU / WA .JPG	
Castle Espie C025	N	A	—	80	CE C 025 CU / WA .JPG	
Castle Espie C050	N	—	—	90	CE C 050 CU / WA .JPG	
Castle Espie C075	N	—	—	70	CE C 075 CU / WA .JPG	
Castle Espie C100	N	A	—	80	CE C 100 CU / WA .JPG	Sampled
Castle Espie C125	N	A	—	80	CE C 125 CU / WA .JPG	
Castle Espie C150	N	A	—	60	CE C 150 CU / WA .JPG	
Castle Espie C175	N	—	—	60	CE C 175 CU / WA .JPG	
Castle Espie C200	N	A	—	70	CE C 200 CU / WA .JPG	
Castle Espie C225	N	—	—	70	CE C 225 CU / WA .JPG	Sampled
Castle Espie C250	N	—	—	30	CE C 250 CU / WA .JPG	
Castle Espie C275	—	—	—	0	CE C 275 CU / WA .JPG	
Castle Espie C300	—	—	—	0	CE C 300 CU / WA .JPG	
Castle Espie C325	—	—	—	0	CE C 325 CU / WA .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 3d: Details for Castle Espie, (Transect D), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Castle Espie D000	—	—	—	0	CE D 000 CU / WA .JPG	
Castle Espie D100	—	A	—	<<10	CE D 100 CU / WA .JPG	
Castle Espie D200	N	A	—	60	CE D 200 CU / WA .JPG	
Castle Espie D300	N	A	—	70	CE D 300 CU / WA .JPG	
Castle Espie D400	N	A	—	70	CE D 400 CU / WA .JPG	
Castle Espie D500	N	A	—	70	CE D 500 CU / WA .JPG	
Castle Espie D600	N	A	—	70	CE D 600 CU / WA .JPG	
Castle Espie D700	N	A	—	70	CE D 700 CU / WA .JPG	
Castle Espie D800	N	A	—	70	CE D 800 CU / WA .JPG	
Castle Espie D900	N	A	—	70	CE D 900 CU / WA .JPG	
Castle Espie D1000	N	A	—	60	CE D 1000 CU / WA .JPG	
Castle Espie D1100	N	A	—	70	CE D 1100 CU / WA .JPG	
Castle Espie D1200	N	A	—	70	CE D 1200 CU / WA .JPG	
Castle Espie D1300	N	A	—	70	CE D 1300 CU / WA .JPG	
Castle Espie D1400	N	—	E	40	CE D 1400 CU / WA .JPG	
Castle Espie D1500	N	—	E	10	CE D 1500 CU / WA .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 3e: Biomass details for Castle Espie, Strangford Lough

Site	Above dry biomass per m ² (g)		Below dry biomass per m ² (g)		Total dry biomass per m ² (g)	
	Mean	SE	Mean	SE	Mean	SE
Castle Espie A200	84.8	7.3	54.9	15.2	139.7	9.2
Castle Espie A450	27.1	7.2	39.6	4.3	66.7	11.4
Castle Espie A700	116.2	9.9	65.8	14.6	182.0	24.2
Castle Espie B250	12.4	0.6	14.0	1.9	26.4	2.4
Castle Espie B500	86.8	7.5	33.1	8.2	119.9	9.8
Castle Espie B750	35.1	22.2	18.1	6.0	53.1	28.2
Castle Espie C100	53.1	6.6	36.2	8.6	89.4	15.1
Castle Espie C225	22.9	1.1	19.5	2.3	42.4	1.2

Appendix 4a: Details for Greyabbey (Transect A), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Greyabbey A 000	—	—	—	0	Greyabbey A 000 CU/WA.JPG	
Greyabbey A 050	N	—	—	50	Greyabbey A 050 CU/WA.JPG	
Greyabbey A 100	N	—	—	50	Greyabbey A 100 CU/WA.JPG	
Greyabbey A 150	N	—	—	60	Greyabbey A 150 CU/WA.JPG	
Greyabbey A 200	N	—	—	40	Greyabbey A 200 CU/WA.JPG	Sampled
Greyabbey A 250	N	A	—	60	Greyabbey A 250 CU/WA.JPG	
Greyabbey A 300	N	A	—	60	Greyabbey A 300 CU/WA.JPG	
Greyabbey A 350	N	A	—	60	Greyabbey A 350 CU/WA.JPG	
Greyabbey A 400	N	A	—	60	Greyabbey A 400 CU/WA.JPG	Sampled
Greyabbey A 450	N	A	—	60	Greyabbey A 450 CU/WA.JPG	
Greyabbey A 500	N	A	—	70	Greyabbey A 500 CU/WA.JPG	
Greyabbey A 550	N	A	—	70	Greyabbey A 550 CU/WA.JPG	
Greyabbey A 600	N	A	—	70	Greyabbey A 600 CU/WA.JPG	Sampled
Greyabbey A 650	N	A	—	70	Greyabbey A 650 CU/WA.JPG	
Greyabbey A 700	N	A	—	70	Greyabbey A 700 CU/WA.JPG	
Greyabbey A 750	N	A	—	30	Greyabbey A 750 CU/WA.JPG	
Greyabbey A 800	N	A	—	30	Greyabbey A 800 CU/WA.JPG	
Greyabbey A 850	N	A	—	60	Greyabbey A 850 CU/WA.JPG	
Greyabbey A 900	—	—	—	0	Greyabbey A 900 CU/WA.JPG	
Greyabbey A 950	N	—	E	60	Greyabbey A 950 CU/WA.JPG	
Greyabbey A 1000	N	—	—	<<10	Greyabbey A 1000 CU/WA.JPG	
Greyabbey A 1050	—	—	—	0	Greyabbey A 1050 CU/WA.JPG	
Greyabbey A 1100	—	—	—	0	Greyabbey A 1100 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 4b: Details for Greyabbey (Transect B), Starngford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Greyabbey B 000	—	—	—	0	Greyabbey B 000 CU/WA.JPG	
Greyabbey B 050	N	—	—	60	Greyabbey B 050 CU/WA.JPG	
Greyabbey B 100	N	—	—	60	Greyabbey B 100 CU/WA.JPG	
Greyabbey B 150	N	A	—	70	Greyabbey B 150 CU/WA.JPG	
Greyabbey B 200	N	—	—	40	Greyabbey B 200 CU/WA.JPG	
Greyabbey B 250	N	A	—	50	Greyabbey B 250 CU/WA.JPG	
Greyabbey B 300	N	A	—	60	Greyabbey B 300 CU/WA.JPG	Sampled
Greyabbey B 350	N	A	—	70	Greyabbey B 350 CU/WA.JPG	
Greyabbey B 400	N	A	—	70	Greyabbey B 400 CU/WA.JPG	
Greyabbey B 450	N	A	—	70	Greyabbey B 450 CU/WA.JPG	
Greyabbey B 500	N	A	—	70	Greyabbey B 500 CU/WA.JPG	
Greyabbey B 550	N	A	—	70	Greyabbey B 550 CU/WA.JPG	
Greyabbey B 600	N	A	—	50	Greyabbey B 600 CU/WA.JPG	Sampled
Greyabbey B 650	N	—	—	20	Greyabbey B 650 CU/WA.JPG	
Greyabbey B 700	N	—	—	30	Greyabbey B 700 CU/WA.JPG	
Greyabbey B 750	N	—	—	10	Greyabbey B 750 CU/WA.JPG	
Greyabbey B 800	—	—	—	0	Greyabbey B 800 CU/WA.JPG	
Greyabbey B 850	—	—	—	0	Greyabbey B 850 CU/WA.JPG	
Greyabbey B 900	—	—	—	0	Greyabbey B 900 CU/WA.JPG	
Greyabbey B 950	—	—	—	0	Greyabbey B 950 CU/WA.JPG	
Greyabbey B 1000	—	—	—	0	Greyabbey B 1000 CU/WA.JPG	
Greyabbey B 1050	N	—	—	<<10	Greyabbey B 1050 CU/WA.JPG	
Greyabbey B 1100	N	—	—	20	Greyabbey B 1100 CU/WA.JPG	
Greyabbey B 1150	N	—	—	50	Greyabbey B 1150 CU/WA.JPG	
Greyabbey B 1200	N	—	—	40	Greyabbey B 1200 CU/WA.JPG	Sampled
Greyabbey B 1250	N	—	—	60	Greyabbey B 1250 CU/WA.JPG	
Greyabbey B 1300	N	—	—	60	Greyabbey B 1300 CU/WA.JPG	
Greyabbey B 1350	N	—	—	90	Greyabbey B 1350 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 4c: Details for Greyabbey (Transect C), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Greyabbey C 000	N	A	—	<<10	Greyabbey C 000 CU/WA.JPG	
Greyabbey C 050	N	—	—	10	Greyabbey C 050 CU/WA.JPG	
Greyabbey C 100	N	—	—	60	Greyabbey C 100 CU/WA.JPG	
Greyabbey C 150	N	—	—	40	Greyabbey C 150 CU/WA.JPG	
Greyabbey C 200	N	—	—	50	Greyabbey C 200 CU/WA.JPG	Sampled
Greyabbey C 250	N	—	—	30	Greyabbey C 250 CU/WA.JPG	
Greyabbey C 300	N	—	—	30	Greyabbey C 300 CU/WA.JPG	
Greyabbey C 350	—	—	—	0	Greyabbey C 350 CU/WA.JPG	
Greyabbey C 400	—	—	—	0	Greyabbey C 400 CU/WA.JPG	
Greyabbey C 450	—	—	—	0	Greyabbey C 450 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp.Cover

Appendix 4d: Details for Mid Island South, Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
MID SOUTH 000	—	—	—	0	MID SOUTH 000 CU/WA.JPG	
MID SOUTH 050	N	A	—	60	MID SOUTH 050 CU/WA.JPG	
MID SOUTH 100	N	A	—	60	MID SOUTH 100 CU/WA.JPG	Sampled
MID SOUTH 150	N	A	—	40	MID SOUTH 150 CU/WA.JPG	
MID SOUTH 200	N	A	—	30	MID SOUTH 200 CU/WA.JPG	
MID SOUTH 250		A	—	<<10	MID SOUTH 250 CU/WA.JPG	
MID SOUTH 300	N	A	—	20	MID SOUTH 300 CU/WA.JPG	
MID SOUTH 350	N	A	—	10	MID SOUTH 350 CU/WA.JPG	
MID SOUTH 400	—	—	—	0	MID SOUTH 400 CU/WA.JPG	
MID SOUTH 450	—	—	—	0	MID SOUTH 450 CU/WA.JPG	
MID SOUTH 500	—	—	—	0	MID SOUTH 500 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp.Cover

Appendix 4e: Biomass details for Greyabbey, Strangford Lough

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
Greyabbey A 200	13.4	0.7	31.1	2.7	44.5	3.4
Greyabbey A 400	24.4	6.0	42.7	7.4	67.1	12.9
Greyabbey A 600	39.8	13.5	50.2	6.3	89.9	19.7
Greyabbey B 300	35.3	2.9	42.5	2.2	77.8	2.4
Greyabbey B 600	29.1	9.3	42.1	10.1	71.2	17.6
Greyabbey B1200	21.0	2.0	40.8	7.8	61.8	9.7
Greyabbey C 200	32.4	3.4	53.9	3.1	86.3	0.7
MIDS SOUTH 100	25.7	2.2	29.9	7.1	55.6	8.5

Appendix 5a: Details for Seabank, Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Seabank 000				0	Seabank 000 CU/WA.JPG	
Seabank 025	N	—	—	70	Seabank 025 CU/WA.JPG	
Seabank 050	N	—	—	70	Seabank 050 CU/WA.JPG	Sampled
Seabank 075	N	—	—	50	Seabank 075 CU/WA.JPG	
Seabank 100	N	—	—	10	Seabank 100 CU/WA.JPG	
Seabank 125	—	—	—	0	Seabank 125 CU/WA.JPG	
Seabank 150	—	—	—	0	Seabank 150 CU/WA.JPG	
Seabank 175	—	—	—	0	Seabank 175 CU/WA.JPG	
Seabank 200	—	—	—	0	Seabank 200 CU/WA.JPG	

N = Presence of *Zostera noltii*
 A = Presence of *Zostera angustifolia*
 E = Presence of *Enteromorpha* spp.
 % = Estimate of *Zostera* spp. Cover

Appendix 5b: Biomass details for Seabank, Strangford Lough

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
Seabank	33.7	9.2	52.2	18.0	85.9	27.0

Appendix 6a: Details for Gasworks (Transect A), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Gasworks A 000	—	—	—	0	Gasworks A 000 CU / WA .JPG	
Gasworks A 050	N	A	—	90	Gasworks A 050 CU / WA .JPG	
Gasworks A 100	N	A	—	70	Gasworks A 100 CU / WA .JPG	
Gasworks A 150	N	A	—	70	Gasworks A 150 CU / WA .JPG	Sampled
Gasworks A 200	N	A	—	70	Gasworks A 200 CU / WA .JPG	
Gasworks A 250	N	A	—	60	Gasworks A 250 CU / WA .JPG	
Gasworks A 300	N	A	—	40	Gasworks A 300 CU / WA .JPG	Sampled
Gasworks A 350	N	A	—	10	Gasworks A 350 CU / WA .JPG	
Gasworks A 400	—	—	—	0	Gasworks A 400 CU / WA .JPG	
Gasworks A 450	—	—	—	0	Gasworks A 450 CU / WA .JPG	
Gasworks A 500	—	—	—	0	Gasworks A 500 CU / WA .JPG	
Gasworks A 550	—	—	—	0	Gasworks A 550 CU / WA .JPG	

N = Presence of *Zostera noltii*
 A = Presence of *Zostera angustifolia*
 E = Presence of *Enteromorpha* spp.
 % = Estimate of *Zostera* spp. Cover

Appendix 6b: Details for Gasworks (Transect B), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Gasworks B 000	—	—	—	0	Gasworks B 000 CU / WA .JPG	
Gasworks B 050	N	A	—	70	Gasworks B 050 CU / WA .JPG	
Gasworks B 100	N	A	—	80	Gasworks B 100 CU / WA .JPG	
Gasworks B 150	N	A	—	80	Gasworks B 150 CU / WA .JPG	
Gasworks B 200	N	A	—	80	Gasworks B 200 CU / WA .JPG	Sampled
Gasworks B 250	N	A	—	70	Gasworks B 250 CU / WA .JPG	
Gasworks B 300	N	A	—	80	Gasworks B 300 CU / WA .JPG	
Gasworks B 350	N	A	—	70	Gasworks B 350 CU / WA .JPG	
Gasworks B 400	N	A	—	80	Gasworks B 400 CU / WA .JPG	Sampled
Gasworks B 450	N	A	—	60	Gasworks B 450 CU / WA .JPG	
Gasworks B 500	—	A	—	<<10	Gasworks B 500 CU / WA .JPG	
Gasworks B 550	—	—	—	0	Gasworks B 550 CU / WA .JPG	

N = Presence of *Zostera noltii*
 A = Presence of *Zostera angustifolia*
 E = Presence of *Enteromorpha* spp.
 % = Estimate of *Zostera* spp. Cover

Appendix 6c: Details for Gasworks (Transect C), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Gasworks C 000	—	—	—	0	Gasworks C 000 CU / WA .JPG	
Gasworks C 050	N	A	—	70	Gasworks C 050 CU / WA .JPG	
Gasworks C 100	N	A	—	80	Gasworks C 100 CU / WA .JPG	Sampled
Gasworks C 150	N	A	—	40	Gasworks C 150 CU / WA .JPG	
Gasworks C 200	N	—	—	<<10	Gasworks C 200 CU / WA .JPG	
Gasworks C 250	N	—	—	<<10	Gasworks C 250 CU / WA .JPG	
Gasworks C 300	—	—	—	0	Gasworks C 300 CU / WA .JPG	
Gasworks C 350	—	—	—	0	Gasworks C 350 CU / WA .JPG	
Gasworks C 400	—	—	—	0	Gasworks C 400 CU / WA .JPG	
Gasworks C 450	—	—	—	0	Gasworks C 450 CU / WA .JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 6d: Biomass details for Gasworks, Strangford Lough

Site	Above dry biomass per m ² (g)		Below dry biomass per m ² (g)		Total dry biomass per m ² (g)	
	Mean	SE	Mean	SE	Mean	SE
Gasworks A 150	29.7	9.5	71.2	19.0	100.9	23.1
Gasworks A 300	23.8	7.3	91.5	14.3	115.3	19.1
Gasworks B 200	46.2	12.0	44.5	8.8	90.7	3.3
Gasworks B 400	60.6	4.0	97.0	20.0	157.6	22.7
Gasworks C 100	44.7	11.3	45.9	4.9	90.6	11.5

Appendix 7a: Details for Castle Espie to Paddies Point (Transect A), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
CEtoPP A 000	N	—	—	0	CEtoPP A 000 CU/WA.JPG	
CEtoPP A 025	N	A	—	80	CEtoPP A 025 CU/WA.JPG	
CEtoPP A 050	N	A	—	80	CEtoPP A 050 CU/WA.JPG	
CEtoPP A 075	N	A	—	80	CEtoPP A 075 CU/WA.JPG	
CEtoPP A 100	N	A	—	80	CEtoPP A 100 CU/WA.JPG	Sampled
CEtoPP A 125	N	A	—	80	CEtoPP A 125 CU/WA.JPG	
CEtoPP A 150	N	A	—	80	CEtoPP A 150 CU/WA.JPG	
CEtoPP A 175	N	A	—	80	CEtoPP A 175 CU/WA.JPG	
CEtoPP A 200	N	A	—	80	CEtoPP A 200 CU/WA.JPG	
CEtoPP A 225	N	A	—	60	CEtoPP A 225 CU/WA.JPG	
CEtoPP A 250	N	A	—	80	CEtoPP A 250 CU/WA.JPG	
CEtoPP A 275	N	A	—	80	CEtoPP A 275 CU/WA.JPG	
CEtoPP A 300	N	A	—	80	CEtoPP A 300 CU/WA.JPG	
CEtoPP A 325	N	A	—	80	CEtoPP A 325 CU/WA.JPG	
CEtoPP A 350	N	A	—	80	CEtoPP A 350 CU/WA.JPG	Sampled
CEtoPP A 375	N	A	E	80	CEtoPP A 375 CU/WA.JPG	
CEtoPP A 400	N	A	—	80	CEtoPP A 400 CU/WA.JPG	
CEtoPP A 425	—	—	—	0	CEtoPP A 425 CU/WA.JPG	
CEtoPP A 450	—	—	—	0	CEtoPP A 450 CU/WA.JPG	
CEtoPP A 475	—	—	—	0	CEtoPP A 475 CU/WA.JPG	
CEtoPP A 500	—	—	—	0	CEtoPP A 500 CU/WA.JPG	
CEtoPP A 525	—	—	—	0	CEtoPP A 525 CU/WA.JPG	
CEtoPP A 550	—	—	—	0	CEtoPP A 550 CU/WA.JPG	
CEtoPP A 575	—	—	—	0	CEtoPP A 575 CU/WA.JPG	
CEtoPP A 600	—	—	—	0	CEtoPP A 600 CU/WA.JPG	
CEtoPP A 625	—	—	—	0	CEtoPP A 625 CU/WA.JPG	
CEtoPP A 650	—	—	—	0	CEtoPP A 650 CU/WA.JPG	
CEtoPP A 675	—	—	—	0	CEtoPP A 675 CU/WA.JPG	
CEtoPP A 700	—	—	—	0	CEtoPP A 700 CU/WA.JPG	
CEtoPP A 725	—	—	—	0	CEtoPP A 725 CU/WA.JPG	
CEtoPP A 750	—	—	—	0	CEtoPP A 750 CU/WA.JPG	
CEtoPP A 775	—	—	—	0	CEtoPP A 775 CU/WA.JPG	
CEtoPP A 800	—	—	—	0	CEtoPP A 800 CU/WA.JPG	
CEtoPP A 825	—	—	—	0	CEtoPP A 825 CU/WA.JPG	
CEtoPP A 850	—	—	—	0	CEtoPP A 850 CU/WA.JPG	
CEtoPP A 875	—	—	—	0	CEtoPP A 875 CU/WA.JPG	
CEtoPP A 900	—	—	—	0	CEtoPP A 900 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 7b: Details for Castle Espie to Paddies Point (Transect B), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
CEtoPP B 000	N	—	—	50	CEtoPP B 000 CU/WA.JPG	
CEtoPP B 050	N	A	—	50	CEtoPP B 050 CU/WA.JPG	
CEtoPP B 100	N	A	—	60	CEtoPP B 100 CU/WA.JPG	
CEtoPP B 150	N	A	—	80	CEtoPP B 150 CU/WA.JPG	
CEtoPP B 200	N	A	—	80	CEtoPP B 200 CU/WA.JPG	Sampled
CEtoPP B 250	N	A	—	70	CEtoPP B 250 CU/WA.JPG	
CEtoPP B 300	N	A	—	60	CEtoPP B 300 CU/WA.JPG	
CEtoPP B 350	N	A	—	60	CEtoPP B 350 CU/WA.JPG	
CEtoPP B 400	N	A	—	<<10	CEtoPP B 400 CU/WA.JPG	
CEtoPP B 450	N	A	—	<<10	CEtoPP B 450 CU/WA.JPG	
CEtoPP B 500	—	—	—	0	CEtoPP B 500 CU/WA.JPG	
CEtoPP B 550	—	—	—	0	CEtoPP B 550 CU/WA.JPG	
CEtoPP B 600	—	—	—	0	CEtoPP B 600 CU/WA.JPG	
CEtoPP B 650	—	—	—	0	CEtoPP B 650 CU/WA.JPG	
CEtoPP B 700	—	—	—	0	CEtoPP B 700 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 7c: Details for Castle Espie to Paddies Point (Transect C), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
CEtoPP C 000	N	—	—	25	CEtoPP C 000 CU/WA.JPG	
CEtoPP C 050	N	A	—	70	CEtoPP C 050 CU/WA.JPG	
CEtoPP C 100	N	A	E	70	CEtoPP C 100 CU/WA.JPG	
CEtoPP C 150	N	A	E	70	CEtoPP C 150 CU/WA.JPG	
CEtoPP C 200	N	A	E	70	CEtoPP C 200 CU/WA.JPG	Sampled
CEtoPP C 250	N	A	—	70	CEtoPP C 250 CU/WA.JPG	
CEtoPP C 300	N	A	—	80	CEtoPP C 300 CU/WA.JPG	
CEtoPP C 350	N	A	—	80	CEtoPP C 350 CU/WA.JPG	
CEtoPP C 400	N	A	—	80	CEtoPP C 400 CU/WA.JPG	
CEtoPP C 450	N	A	—	20	CEtoPP C 450 CU/WA.JPG	
CEtoPP C 500	N	—	—	<<10	CEtoPP C 500 CU/WA.JPG	
CEtoPP C 550	—	—	—	0	CEtoPP C 550 CU/WA.JPG	
CEtoPP C 600	—	—	—	0	CEtoPP C 600 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 7d: Details for Castle Espie to Paddies Point (Transect D), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
CEtoPP D 000	N	—	—	10	CEtoPP D 000 CU/WA.JPG	
CEtoPP D 025	N	—	—	10	CEtoPP D 025 CU/WA.JPG	
CEtoPP D 050	N	A	—	90	CEtoPP D 050 CU/WA.JPG	Sampled
CEtoPP D 075	N	A	—	70	CEtoPP D 075 CU/WA.JPG	
CEtoPP D 100	N	A	—	40	CEtoPP D 100 CU/WA.JPG	
CEtoPP D 125	N	—	—	<<10	CEtoPP D 125 CU/WA.JPG	
CEtoPP D 150	—	—	—	0	CEtoPP D 150 CU/WA.JPG	
CEtoPP D 200	—	—	—	0	CEtoPP D 200 CU/WA.JPG	
CEtoPP D 250	—	—	—	0	CEtoPP D 250 CU/WA.JPG	
CEtoPP D 300	—	—	—	0	CEtoPP D 300 CU/WA.JPG	Sampled
CEtoPP D 350	—	—	—	0	CEtoPP D 350 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 7e: Details for Castle Espie to Paddies Point (Transect E), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
CEtoPP E 000	—	—	—	0	CEtoPP E 000 CU/WA.JPG	
CEtoPP E 050	N	—	—	40	CEtoPP E 050 CU/WA.JPG	
CEtoPP E 100	N	—	—	60	CEtoPP E 100 CU/WA.JPG	
CEtoPP E 150	N	—	—	40	CEtoPP E 150 CU/WA.JPG	
CEtoPP E 200	N	—	—	40	CEtoPP E 200 CU/WA.JPG	
CEtoPP E 250	N	—	—	30	CEtoPP E 250 CU/WA.JPG	
CEtoPP E 300	N	—	—	50	CEtoPP E 300 CU/WA.JPG	
CEtoPP E 350	—	—	—	0	CEtoPP E 350 CU/WA.JPG	
CEtoPP E 400	—	—	—	0	CEtoPP E 400 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 7f: Details for Castle Espie to Paddies Point (Transect F), Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
CEtoPP F 000	—	—	—	0	CEtoPP F 000 CU/WA.JPG	
CEtoPP F 050	N	—	—	80	CEtoPP F 050 CU/WA.JPG	
CEtoPP F 100	N	—	—	80	CEtoPP F 100 CU/WA.JPG	Sampled
CEtoPP F 150	N	—	—	60	CEtoPP F 150 CU/WA.JPG	
CEtoPP F 200	N	—	—	20	CEtoPP F 200 CU/WA.JPG	
CEtoPP F 250	N	—	—	<<10	CEtoPP F 250 CU/WA.JPG	
CEtoPP F 300		—	—	0	CEtoPP F 300 CU/WA.JPG	
CEtoPP F 350	N	A	—	80	CEtoPP F 350 CU/WA.JPG	
CEtoPP F 400	N	—	E	80	CEtoPP F 400 CU/WA.JPG	
CEtoPP F 450		—	—	0	CEtoPP F 450 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 7g: Biomass details for Details for Castle Espie to Paddies Point, Strangford Lough

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
CEtoPP A 100	41.0	6.7	41.1	3.2	82.1	8.9
CEtoPP A 350	62.5	10.8	48.2	12.5	110.6	21.6
CEtoPP B 200	52.4	5.9	59.3	5.7	111.6	5.9
CEtoPP C 250	40.3	1.5	37.5	5.6	77.8	7.0
CEtoPP D 050	57.1	9.0	82.9	22.1	140.1	30.7
CEtoPP D 300	75.4	6.6	52.4	3.5	127.8	3.1
CEtoPP F 100	17.6	11.1	14.0	7.5	31.6	9.4

Appendix 8a: Details for Cunningburn, Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Cunningburn A 000	—	—	—	0	Cunningburn A 000 CU/WA.JPG	
Cunningburn A 025	N	—	—	40	Cunningburn A 025 CU/WA.JPG	
Cunningburn A 050	N	A	—	40	Cunningburn A 050 CU/WA.JPG	
Cunningburn A 075	N	A	—	70	Cunningburn A 075 CU/WA.JPG	
Cunningburn A 100	N	A	—	70	Cunningburn A 100 CU/WA.JPG	Sampled
Cunningburn A 125	N	A	—	60	Cunningburn A 125 CU/WA.JPG	
Cunningburn A 150	N	A	—	40	Cunningburn A 150 CU/WA.JPG	
Cunningburn A 175	N	A	—	40	Cunningburn A 175 CU/WA.JPG	
Cunningburn A 200	N	A	—	30	Cunningburn A 200 CU/WA.JPG	
Cunningburn A 225	—	—	—	0	Cunningburn A 225 CU/WA.JPG	
Cunningburn A 250	—	—	—	0	Cunningburn A 250 CU/WA.JPG	
Cunningburn A 275	—	—	—	0	Cunningburn A 275 CU/WA.JPG	
Cunningburn A 300	—	—	—	0	Cunningburn A 300 CU/WA.JPG	
Cunningburn A 325	—	—	—	0	Cunningburn A 325 CU/WA.JPG	
Cunningburn A 350	—	—	—	0	Cunningburn A 350 CU/WA.JPG	
Cunningburn A 375	—	—	—	0	Cunningburn A 375 CU/WA.JPG	
Cunningburn A 400	—	—	—	0	Cunningburn A 400 CU/WA.JPG	

Appendix 8b: Details for Cunningburn, Strangford Lough

Sample Point	N	A	E	%	Photo Labels	Sampled
Cunningburn B 000	—	—	—	0	Cunningburn B 000 CU/WA.JPG	
Cunningburn B 025	N	—	—	20	Cunningburn B 025 CU/WA.JPG	
Cunningburn B 050	N	—	—	20	Cunningburn B 050 CU/WA.JPG	
Cunningburn B 075	N	—	—	10	Cunningburn B 075 CU/WA.JPG	
Cunningburn B 100	N	—	—	10	Cunningburn B 100 CU/WA.JPG	
Cunningburn B 125	N	—	—	<10	Cunningburn B 125 CU/WA.JPG	
Cunningburn B 150	—	—	—	0	Cunningburn B 150 CU/WA.JPG	
Cunningburn B 125	—	—	—	0	Cunningburn B 125 CU/WA.JPG	
Cunningburn B 200	—	—	—	0	Cunningburn B 200 CU/WA.JPG	
Cunningburn B 225	—	—	—	0	Cunningburn B 225 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 8c: Biomass details for Cunningburn, Strangford Lough

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
Cunn A 100	34.2	5.7	47.3	5.2	81.5	10.2

Appendix 9a: Details of Lough Foyle Individual Beds

Sample Point	N	A	E	%	Photo Labels	Sampled
LF A	N	—	—	0	LF A CU/WA.JPG	
LF B	N	—	—	0	LF B CU/WA.JPG	
LF C	N	—	—	0	LF C CU/WA.JPG	
LF D	N	—	—	0	LF D CU/WA.JPG	
LF E	N	—	—	0	LF E CU/WA.JPG	
LF H	—	—	—	0	LF H CU/WA.JPG	
LF M	N	—	—	0	LF M CU/WA.JPG	Sampled
LF N	—	—	—	0	LF N CU/WA.JPG	
LF P	N	—	—	90	LF P CU/WA.JPG	
LF Q	N	—	—	70	LF Q CU/WA.JPG	
LF R	—	—	—	0	LF R CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 9b: Details of Lough Foyle Bed F

Sample Point	N	A	E	%	Photo Labels	Sampled
LF F 000	—	—	—	0	LF F 000 WA.JPG	
LF F 025	N	—	—	40	LF F 025 CU/WA.JPG	
LF F 050	N	—	—	40	LF F 050 CU/WA.JPG	Sampled
LF F 075	N	—	—	40	LF F 075 CU/WA.JPG	
LF F 100	N	—	—	30	LF F 100 CU/WA.JPG	
LF F 125	N	—	—	30	LF F 125 CU/WA.JPG	
LF F 150	—	—	—	0	LF F 150 CU/WA.JPG	
LF F 175	—	—	—	0	LF F 175 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 9c: Details of Lough Foyle Bed G

Sample Point	N	A	E	%	Photo Labels	Sampled
LF G 025	—	—	—	0	LF G 025 CU/WA.JPG	
LF G 050	—	—	—	0	LF G 050 CU/WA.JPG	
LF G 075	N	—	—	30	LF G 075 CU/WA.JPG	Sampled
LF G 100	N	—	—	30	LF G 100 CU/WA.JPG	
LF G 125	N	—	—	20	LF G 125 CU/WA.JPG	
LF G 150	—	—	—	0	LF G 150 CU/WA.JPG	
LF G 175	—	—	—	0	LF G 175 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 9d: Details of Lough Foyle Bed I

Sample Point	N	A	E	%	Photo Labels	Sampled
LF I 025	N	—	—	70	LF I 025 CU/WA.JPG	
LF I 050	N	—	—	50	LF I 050 CU/WA.JPG	Sampled
LF I 075	N	—	—	50	LF I 075 CU/WA.JPG	
LF I 100	N	—	—	40	LF I 100 CU/WA.JPG	
LF I 125	N	—	—	10	LF I 125 CU/WA.JPG	
LF I 150	—	—	—	0	LF I 150 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 9e: Details of Lough Foyle Bed J

Sample Point	N	A	E	%	Photo Labels	Sampled
LF Ja 000	—	—	—	0	LF Ja 000 CU/WA.JPG	
LF Ja 025	N	—	—	10	LF Ja 025 CU/WA.JPG	
LF Ja 050	N	—	—	20	LF Ja 050 CU/WA.JPG	
LF Ja 075	N	—	—	30	LF Ja 075 CU/WA.JPG	
LF Ja 100	N	—	—	30	LF Ja 100 CU/WA.JPG	Sampled
LF Ja 125	N	—	—	30	LF Ja 125 CU/WA.JPG	
LF Ja 150	N	—	—	40	LF Ja 150 CU/WA.JPG	
LF Ja 175	N	—	—	40	LF Ja 175 CU/WA.JPG	
LF Ja 200	N	—	—	30	LF Ja 200 CU/WA.JPG	
LF Ja 225	N	—	—	20	LF Ja 225 CU/WA.JPG	
LF Ja 250	N	—	—	<10	LF Ja 250 CU/WA.JPG	
LF Ja 275	N	—	—	<10	LF Ja 275 CU/WA.JPG	
LF Ja 300	N	—	—	<10	LF Ja 300 CU/WA.JPG	
LF Ja 325	N	—	—	<10	LF Ja 325 CU/WA.JPG	
LF Ja 350	N	—	—	<10	LF Ja 350 CU/WA.JPG	
LF Ja 375	N	—	—	<10	LF Ja 375 CU/WA.JPG	
LF Ja 400	N	—	—	<10	LF Ja 400 CU/WA.JPG	
LF Ja 425	N	—	—	<10	LF Ja 425 CU/WA.JPG	
LF Ja 450	N	—	—	<10	LF Ja 450 CU/WA.JPG	
LF Ja 475	N	—	—	<10	LF Ja 475 CU/WA.JPG	
LF Ja 500	—	—	—	0	LF Ja 500 CU/WA.JPG	
LF Ja 525	—	—	—	0	LF Ja 525 CU/WA.JPG	
LF Ja 550	—	—	—	0	LF Ja 550 CU/WA.JPG	
LF Jb 000	N	—	—	60	LF Jb 000 CU/WA.JPG	
LF Jb 025	N	—	—	70	LF Jb 025 CU/WA.JPG	
LF Jb 050	N	—	—	70	LF Jb 050 CU/WA.JPG	Sampled
LF Jb 075	N	—	—	60	LF Jb 075 CU/WA.JPG	
LF Jb 100	N	—	—	40	LF Jb 100 CU/WA.JPG	
LF Jb 125	N	—	—	50	LF Jb 125 CU/WA.JPG	
LF Jb 150	—	—	—		LF Jb 150 CU/WA.JPG	
LF Jb 175	N	—	—	10	LF Jb 175 CU/WA.JPG	
LF Jb 200	N	—	—	10	LF Jb 200 CU/WA.JPG	
LF Jb 225	N	—	—	10	LF Jb 225 CU/WA.JPG	
LF Jb 250	N	—	—	<10	LF Jb 250 CU/WA.JPG	
LF Jb 275	N	—	—	<10	LF Jb 275 CU/WA.JPG	
LF Jb 300	N	—	—	<10	LF Jb 300 CU/WA.JPG	
LF Jb 325	—	—	—	0	LF Jb 325 CU/WA.JPG	
LF Jb 350	—	—	—	0	LF Jb 350 CU/WA.JPG	
LF Jb 375	—	—	—	0	LF Jb 375 CU/WA.JPG	

N = Presence of *Zostera noltii*
A = Presence of *Zostera angustifolia*
E = Presence of *Enteromorpha* spp.
% = Estimate of *Zostera* spp. Cover

Appendix 9f: Details of Lough Foyle Bed K

Sample Point	N	A	E	%	Photo Labels	Sampled
LF K 025	N	—	—	20	LF K 025 CU/WA.JPG	
LF K 050	N	—	—	80	LF K 050 CU/WA.JPG	Sampled
LF K 075	N	—	—	70	LF K 075 CU/WA.JPG	
LF K 100	N	—	—	40	LF K 100 CU/WA.JPG	
LF K 125	—	—	—	0	LF K 125 CU/WA.JPG	
LF K 150	—	—	—	0	LF K 150 CU/WA.JPG	

Appendix 9g: Details of Lough Foyle Bed L

Sample Point	N	A	E	%	Photo Labels	Sampled
LF La 025	—	—	—	0	LF La 025 CU/WA.JPG	
LF La 050	N	—	—	90	LF La 050 CU/WA.JPG	
LF La 075	N	—	—	90	LF La 075 CU/WA.JPG	
LF La 100	N	—	—	90	LF La 100 CU/WA.JPG	Sampled
LF La 125	N	—	—	90	LF La 125 CU/WA.JPG	
LF La 150	N	—	—	90	LF La 150 CU/WA.JPG	
LF La 175	N	—	—	90	LF La 175 CU/WA.JPG	
LF La 200	N	—	—	90	LF La 200 CU/WA.JPG	Sampled
LF La 225	N	—	—	80	LF La 225 CU/WA.JPG	
LF La 250	N	—	—	80	LF La 250 CU/WA.JPG	
LF La 275	N	—	—	60	LF La 275 CU/WA.JPG	
LF La 300	N	—	—	60	LF La 300 CU/WA.JPG	
LF La 325	N	—	—	40	LF La 325 CU/WA.JPG	
LF La 350	N	—	—	20	LF La 350 CU/WA.JPG	
LF La 375	—	—	—	0	LF La 375 CU/WA.JPG	
LF La 400	—	—	—	0	LF La 400 CU/WA.JPG	
LF La 425	—	—	—	0	LF La 425 CU/WA.JPG	
LF Lb 025	N	—	—	90	LF Lb 025 CU/WA.JPG	
LF Lb 050	N	—	—	90	LF Lb 050 CU/WA.JPG	
LF Lb 075	N	—	—	80	LF Lb 075 CU/WA.JPG	
LF Lb 100	N	—	—	70	LF Lb 100 CU/WA.JPG	Sampled
LF Lb 125	N	—	—	80	LF Lb 125 CU/WA.JPG	
LF Lb 150	N	—	—	50	LF Lb 150 CU/WA.JPG	
LF Lb 175	N	—	—	50	LF Lb 175 CU/WA.JPG	
LF Lb 200	N	—	—	60	LF Lb 200 CU/WA.JPG	Sampled
LF Lb 225	N	—	—	80	LF Lb 225 CU/WA.JPG	
LF Lb 250	N	—	—	30	LF Lb 250 CU/WA.JPG	
LF Lb 275	—	—	—	0	LF Lb 275 CU/WA.JPG	
LF Lb 300	—	—	—	0	LF Lb 300 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 9h: Details of Lough Foyle Bed O

Sample Point	N	A	E	%	Photo Labels	Sampled
LF O 050	N			90	LF O 050 CU/WA.JPG	Sampled
LF O 100	N	—	—	90	LF O 100 CU/WA.JPG	
LF O 150	—	—	—	0	LF O 150 CU/WA.JPG	
LF O 200	—	—	—	0	LF O 200 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 9i: Details of Lough Foyle Bed S

Sample Point	N	A	E	%	Photo Labels	Sampled
LF Sa 025	N	—	—	60	LF Sa 025 CU/WA.JPG	
LF Sa 050	N	—	—	90	LF Sa 050 CU/WA.JPG	Sampled
LF Sa 075	N	—	—	90	LF Sa 075 CU/WA.JPG	
LF Sa 100	N	—	—	90	LF Sa 100 CU/WA.JPG	
LF Sa 125	N	—	—	40	LF Sa 125 CU/WA.JPG	
LF Sa 150	—	—	—	0	LF Sa 150 CU/WA.JPG	
LF Sb 025	N	—	—	90	LF Sb 025 CU/WA.JPG	
LF Sb 050	N	—	—	90	LF Sb 050 CU/WA.JPG	Sampled
LF Sb 075	N	—	—	90	LF Sb 075 CU/WA.JPG	
LF Sb 100	N	—	—	90	LF Sb 100 CU/WA.JPG	
LF Sb 125	N	—	—	60	LF Sb 125 CU/WA.JPG	
LF Sb 150	—	—	—	0	LF Sb 150 CU/WA.JPG	
LF Sb 175	—	—	—	0	LF Sb 175 CU/WA.JPG	
LF Sb 200	—	—	—	0	LF Sb 200 CU/WA.JPG	

N = Presence of *Zostera noltii*

A = Presence of *Zostera angustifolia*

E = Presence of *Enteromorpha* spp.

% = Estimate of *Zostera* spp. Cover

Appendix 9I: Biomass Details for Lough Foyle

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
LF F 050	20.2	1.8	20.8	0.6	41.0	2.3
LF G 075	35.3	6.4	32.8	2.4	68.1	7.5
LF I 050	22.4	7.7	15	1.0	37.4	2.1
LF Ja 075	12.2	2.3	12.5	3.2	24.7	5.1
LF Jb 050	37.7	5.0	27.0	4.8	64.7	4.9
LF K 050	54.6	20.8	17.8	7.3	72.4	27.6
LF La 100	61.2	4.5	21.9	2.3	83.0	6.0
LF La 200	28.9	13.9	13.7	8.0	42.6	21.0
LF Lb 100	12.6	1.4	3.7	1.6	16.3	3.0
LF Lb 200	20.1	5.3	14.9	1.8	35.0	7.1
LF M	96.0	43.1	38.9	6.0	134.9	47.0
LF O	51.8	6.2	14.7	2.4	66.5	8.6
LF Sa 050	111.4	14.5	58.9	5.5	170.3	18.2
LF Sb 050	162.5	41.4	67.1	23.9	229.6	64.6
LF T 075	21.0	4.6	19.9	9.0	40.9	10.6
LF U 100	192.9	37.7	67.9	20.6	260.7	58.3
Maximum	192.9	43.1	67.9	23.9	260.7	64.6
Mean	58.8	13.5	28.0	6.3	86.8	18.4

Appendix 10a: Details for Dundrum

Sample Point	N	A	E	%	Photo Labels	Sampled
MUR 000	—	—	—	0	MUR 000 CU/WA.JPG	
MUR 025	—	—	E	0	MUR 025 CU/WA.JPG	
MUR 050	—	A	E	<10	MUR 050 CU/WA.JPG	
MUR075	—	A	E	<10	MUR075 CU/WA.JPG	
MUR 100	—	A	E	80	MUR 100 CU/WA.JPG	
MUR125	—	A	E	80	MUR125 CU/WA.JPG	
MUR150	—	A	E	<10	MUR150 CU/WA.JPG	
MUR175	—	—	E	0	MUR175 CU/WA.JPG	
MUR 200	—	—	E	0	MUR 200 CU/WA.JPG	
MUR 225	—	—	E	0	MUR 225 CU/WA.JPG	
DUN 22 000	—	—	E	0	DUN 22 000 CU/WA.JPG	
DUN 22 025	N	—	E	50	DUN 22 025 CU/WA.JPG	
DUN 22 050	N	—	E	50	DUN 22 050 CU/WA.JPG	
DUN 22 075	N	—	E	50	DUN 22 075 CU/WA.JPG	
DUN 22 100	N	—	E	50	DUN 22 100 CU/WA.JPG	
DUN 22 125	N	A	E	<10	DUN 22 125 CU/WA.JPG	
DUN 22 150	N	—	E	40	DUN 22 150 CU/WA.JPG	
DUN 22 175	N	—	E	60	DUN 22 175 CU/WA.JPG	
DUN 22 200	N	—	—	60	DUN 22 200 CU/WA.JPG	
DUN 22 225	N	—	E	50	DUN 22 225 CU/WA.JPG	

Appendix 10b: Biomass details for Dundrum

Site	Above dry biomass per m ² (g)		Below dry biomass per m ² (g)		Total dry biomass per m ² (g)	
	Mean	SE	Mean	SE	Mean	SE
Dun 20	7.8	2.6	9.0	4.3	16.8	6.9
Dun 21 75	13.8	1.1	13.6	6.3	27.4	6.6
Dun21 150	4.2	0.9	5.9	2.3	10.1	3.2
Dun 21 225	7.8	0.8	7.7	0.5	15.4	0.6
Dun23 Bed x	21.3	14.0	10.1	6.3	31.4	20.4
Maximum	21.3		13.6		31.4	
Mean	11.0		9.2		20.2	

Appendix 11a: Details for Carlingford

Sample Point	N	A	E	%	Photo Labels	Sampled
Carl A 000	—	—	—	0	Carl A 000 CU/WA.JPG	
Carl A 025	—	—	—	0	Carl A 025 CU/WA.JPG	
Carl A 050	N	—	—	70	Carl A 050 CU/WA.JPG	
Carl A 075	N	—	—	70	Carl A 075 CU/WA.JPG	
Carl A 100	N	—	—	70	Carl A 100 CU/WA.JPG	
Carl A 125	N	—	—	70	Carl A 125 CU/WA.JPG	Sampled
Carl A 150	N	—	—	50	Carl A 150 CU/WA.JPG	
Carl A 175	N	—	E	20	Carl A 175 CU/WA.JPG	
Carl A 200	N	—	E	20	Carl A 200 CU/WA.JPG	
Carl A 225	—	—	E	0	Carl A 225 CU/WA.JPG	
Carl A 250	—	—	E	0	Carl A 250 CU/WA.JPG	
Carl A 275	—	—	E	0	Carl A 275 CU/WA.JPG	

N = Presence of *Zostera noltii*
 A = Presence of *Zostera angustifolia*
 E = Presence of *Enteromorpha* spp.
 % = Estimate of *Zostera* spp. Cover

Appendix 11b: Biomass details for Carlingford

Site	Above dry biomass per m ² (g)	Above dry biomass per m ² (g)	Below dry biomass per m ² (g)	Below dry biomass per m ² (g)	Total dry biomass per m ² (g)	Total dry biomass per m ² (g)
	Mean	SE	Mean	SE	Mean	SE
Carl A 125	44.7	11.1	75.4	16.0	120.1	26.6