



Inshore Fisheries and
Conservation Authority

RESEARCH REPORT

2014

HORSESHOE POINT COCKLE STOCK ASSESSMENT

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Introduction

As of April 1st 2011 the Horseshoe Point cockle beds fell within the Eastern IFCA district, whereas previously they fell within the North Eastern Sea Fisheries Committee (NESFC, now North Eastern IFCA) district. For the purpose of this report, Horseshoe Point refers collectively to three cockle beds between Tetney Haven and Donna Nook: Horseshoe Point, Grainthorpe Haven West and Grainthorpe Haven East (referred to here as Grainthorpe West and East respectively) (Fig. 1). Since the introduction of NESFC Byelaw XXIV (Humber Estuary Cockle Fishery Byelaw) in August 2002, cockle fishing in this area has been restricted to hand gathering using rakes with a maximum head width of 305mm and a minimum of 20mm between the teeth. Anybody gathering more than 5kg of cockles per day requires a permit and even with a permit, it is not allowed for any person to remove more than 500kg of cockles within a 24hr period without prior written consent. Under the byelaw, the cockle beds in the area are closed between 1st May and 31st August inclusive but since 2002 the beds have been closed due to low adult stocks.

Historically, the Horseshoe Point cockle beds have supported a commercial fishery with landings in excess of 700 tonnes per year, but stocks in the area are by no means consistent (MacDonald, 2008). In 1996 NESFC commenced bi-annual surveys which, rather than relying on landings data, estimated the weight of commercially sized stock within the beds. In 2000 it was estimated that there were over 400 tonnes of commercially available cockles within the Horseshoe Point beds but by 2001 these levels had declined to around 200 tonnes and by 2003 to 60-90 tonnes (NESFC, 2004). The NESFC bi-annual surveys suggested that in spring 2004 the commercially viable stock within the beds had dropped to just 9 tonnes, equivalent to 8 cockles m⁻², but in autumn 2004 a commercially viable stock of 226 tonnes (160 cockles m⁻²) was recorded. The discrepancy in these figures was put down to a change in survey method and the ephemeral nature of the bed rather than a dramatic increase in stock. Regardless of the reason for the low figures for spring 2004, the autumn 2004 figures suggest that cockle stocks in this area were recovering. However from this point on stocks in the area have continued to decline with 85 tonnes estimated in autumn 2005 and 51 tonnes estimated in autumn 2006 (NESFC 2005 & 2006).

Eastern IFCA has been carrying out foot surveys at Horseshoe Point for the purpose of stock assessment and monitoring, and to assess the possibility of opening the fishery if deemed viable, since January 2011. The surveys have been carried out twice annually where possible and annually where not. The results for the February 2013, August 2013 August 2014 surveys along with an account of recent historic stocks are presented in this report.

Results

February 2013

Horseshoe Point

A summary of cockle stocks at the Horseshoe Point bed can be seen in table 1. A total of 8t was discovered, with 5.5t being adult stock (greater than 14mm in width), and 1.6t being 16mm or greater. Sub-14mm cockle covered 4.2ha of the bed, with a mean weight of 0.6t ha⁻¹, and a mean density of 25 cockles m⁻² (range 10-50 m⁻²) (Fig. 2). Over 14mm cockle covered 4.0ha with a mean weight of 1.4t ha⁻¹, and a mean density of 31.1 cockles m⁻² (range 10-80 m⁻²) (Fig. 3). Over 16mm cockle covered 2.1ha with a mean weight of 0.8t ha⁻¹, and a mean density of 14 cockles m⁻² (range 10-20 m⁻²) (Fig. 4).

Table 1. Summary of the cockle stocks at the Horseshoe Point bed in February 2013

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
<14mm	2.5	25.0	0.6	4.2
≥14mm	5.5	31.1	1.4	4.0
≥16mm	1.6	14.0	0.8	2.1

Grainthorpe West

A summary of cockle stocks at the Grainthorpe West bed can be seen in table 2. A total of 1.8t was discovered, with 1.4t being adult stock (greater than 14mm in width), and 0.2t being 16mm or greater. Sub-14mm cockle covered 1.5ha of the bed, with a mean weight of 0.3t ha⁻¹, and a mean density of 16 cockles m⁻² (range 10-30 m⁻²) (Fig. 2). Over 14mm cockle covered 2.2ha with a mean weight of 0.6t ha⁻¹, and a mean density of 18.3 cockles m⁻² (range 10-30 m⁻²) (Fig. 3). Over 16mm cockle covered 0.4ha with a mean weight of 0.4t ha⁻¹, and a mean density of 10 cockles m⁻² (range 10-10 m⁻²) (Fig. 4).

Table 2. Summary of the cockle stocks at the Grainthorpe West bed in February 2013

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
<14mm	0.4	16.0	0.3	1.5
≥14mm	1.4	18.3	0.6	2.2
≥16mm	0.2	10.0	0.4	0.4

Grainthorpe East

A summary of cockle stocks at the Grainthorpe East bed can be seen in table 3. A total of 1.6t was discovered, with 0.9t being adult stock (greater than 14mm in width), and 0.1t being 16mm or greater. Sub-14mm cockle covered 2.0ha of the bed, with a mean weight of 0.3t ha⁻¹, and a mean density of 20 cockles m⁻² (range 10-40 m⁻²) (Fig. 2). Over 14mm cockle covered 2.3ha with a mean weight of 0.4t ha⁻¹, and a mean density of 13.3 cockles m⁻² (range 10-20 m⁻²) (Fig. 3). Over 16mm cockle covered 0.2ha with a

mean weight of 0.4t ha⁻¹, and a mean density of 10 cockles m⁻² (range 10-10 m⁻²) (Fig. 4).

Table 3. Summary of the cockle stocks at the Grainthorpe East bed in February 2013

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
<14mm	0.7	20.0	0.3	2.0
≥14mm	0.9	13.3	0.4	2.3
≥16mm	0.1	10.0	0.4	0.2

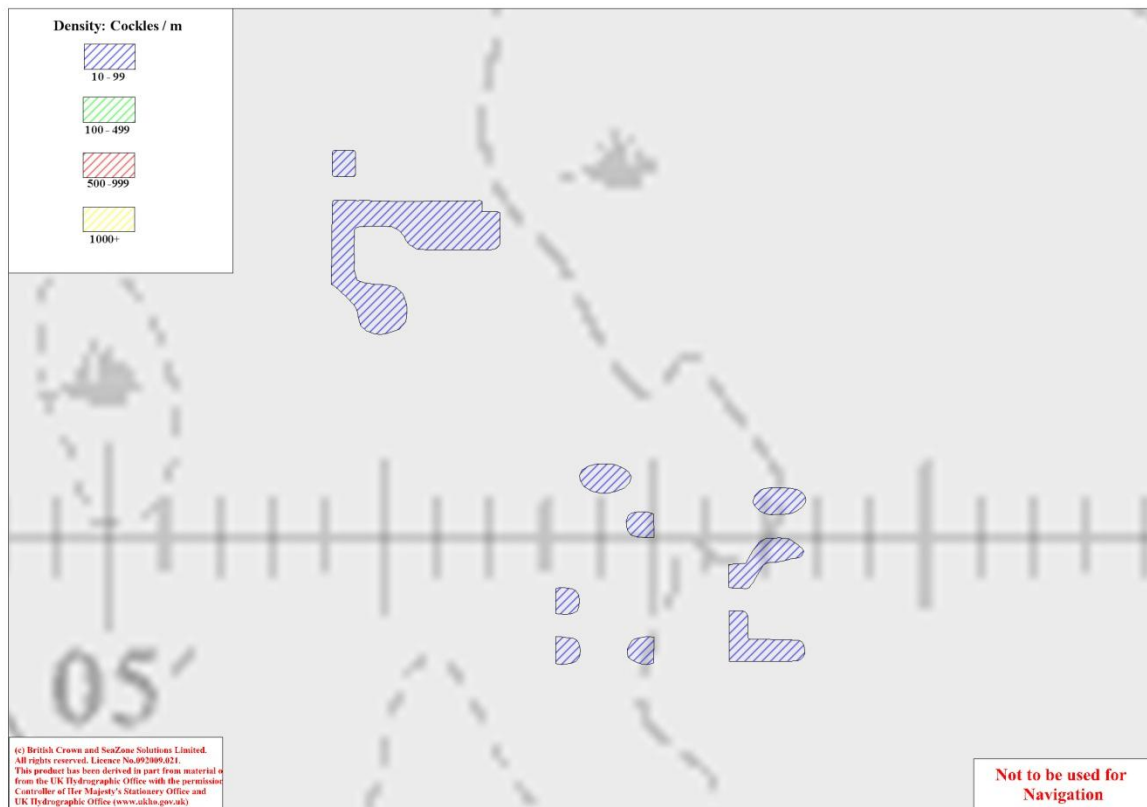


Fig 2. Distribution of <14mm cockles on all beds at Horseshoe Point in August 2014

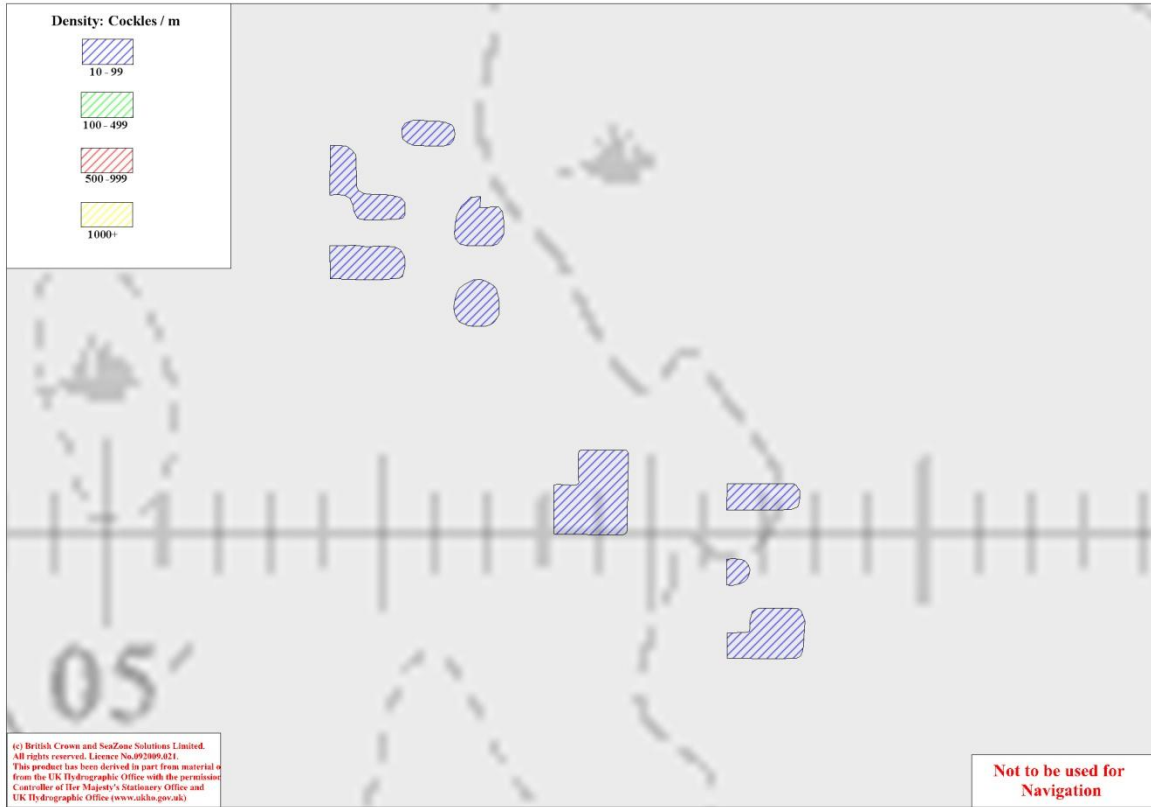


Fig 3. Distribution of $\geq 14\text{mm}$ cockles on all beds at Horseshoe Point in August 2014

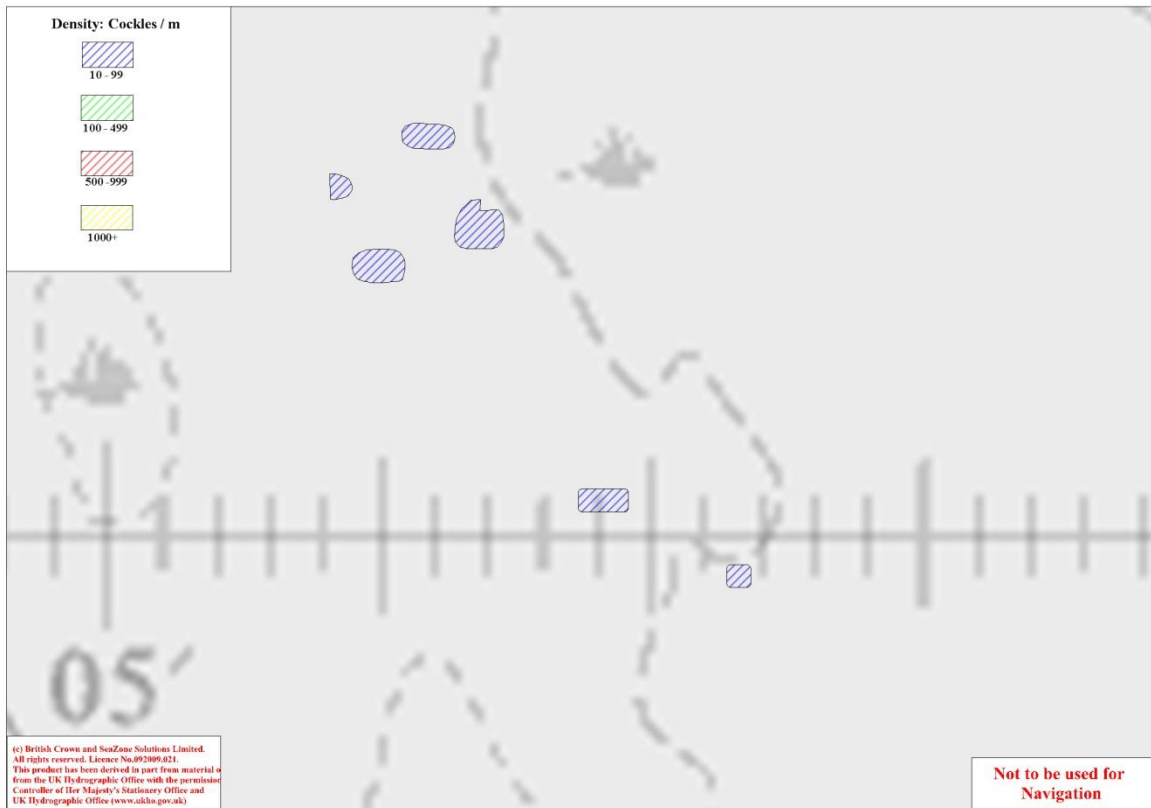


Fig 4. Distribution of $\geq 16\text{mm}$ cockles on all beds at Horseshoe Point in August 2014

August 2013

Horseshoe Point

A summary of cockle stocks at the Horseshoe Point bed can be seen in table 4. A total of 61t was discovered, with 5t being adult stock (greater than 16mm in width). Spat covered 20ha of the bed, with a mean weight of 2.0t ha⁻¹, and a mean density of 1417.5 cockles m⁻² (range 30-6740 m⁻²) (Fig. 5). Sub-16mm cockle covered 18.4ha of the bed, with a mean weight of 1.8t ha⁻¹, and a mean density of 133.9 cockles m⁻² (range 10-880 m⁻²) (Fig. 6). Over 16mm cockle covered 7.1ha with a mean weight of 0.7t ha⁻¹, and a mean density of 10.0 cockles m⁻² (range 10-10 m⁻²) (Fig. 7).

Table 4. Summary of the cockle stocks at the Horseshoe Point bed in August 2013

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
Spat	20.0	1417.5	2.0	20.0
<16mm	34.0	133.9	1.8	18.4
≥16mm	5.0	10.0	0.7	7.1

Grainthorpe West

A summary of cockle stocks at the Grainthorpe West bed can be seen in table 5. A total of 14.7t was discovered, with 2.5t being adult stock (greater than 16mm in width). Spat covered 1.8ha of the bed, with a mean weight of 0.1t ha⁻¹, and a mean density of 35 cockles m⁻² (range 30-40 m⁻²) (Fig. 5). Sub-16mm cockle covered 4.9ha of the bed, with a mean weight of 2.4t ha⁻¹, and a mean density of 182 cockles m⁻² (range 10-680 m⁻²) (Fig. 6). Over 16mm cockle covered 3.7ha with a mean weight of 0.7t ha⁻¹, and a mean density of 12.5 cockles m⁻² (range 10-20 m⁻²) (Fig. 7).

Table 5. Summary of the cockle stocks at the Grainthorpe West bed in August 2013

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
Spat	0.2	35.0	0.1	1.8
<16mm	12.0	182.0	2.4	4.9
≥16mm	2.5	12.5	0.7	3.7

Grainthorpe East

A summary of cockle stocks at the Grainthorpe East bed can be seen in table 6. A total of 23.8t was discovered, with 9t being adult stock (greater than 16mm in width). Spat covered 8.3ha of the bed, with a mean weight of 1.7t ha⁻¹, and a mean density of 2047 cockles m⁻² (range 210-10290 m⁻²) (Fig. 5). Sub-16mm cockle covered 7.1ha of the bed, with a mean weight of 1.2t ha⁻¹, and a mean density of 102.9 cockles m⁻² (range 10-270 m⁻²) (Fig. 6). Over 16mm cockle covered 0.8ha with a mean weight of 0.9t ha⁻¹, and a mean density of 20.0 cockles m⁻² (range 20-20 m⁻²) (Fig. 7).

Table 6. Summary of the cockle stocks at the Grainthorpe East bed in August 2013

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
Spat	14.0	2047.0	1.7	8.3
<16mm	9.0	102.9	1.2	7.1
≥16mm	0.8	20.0	0.9	0.8

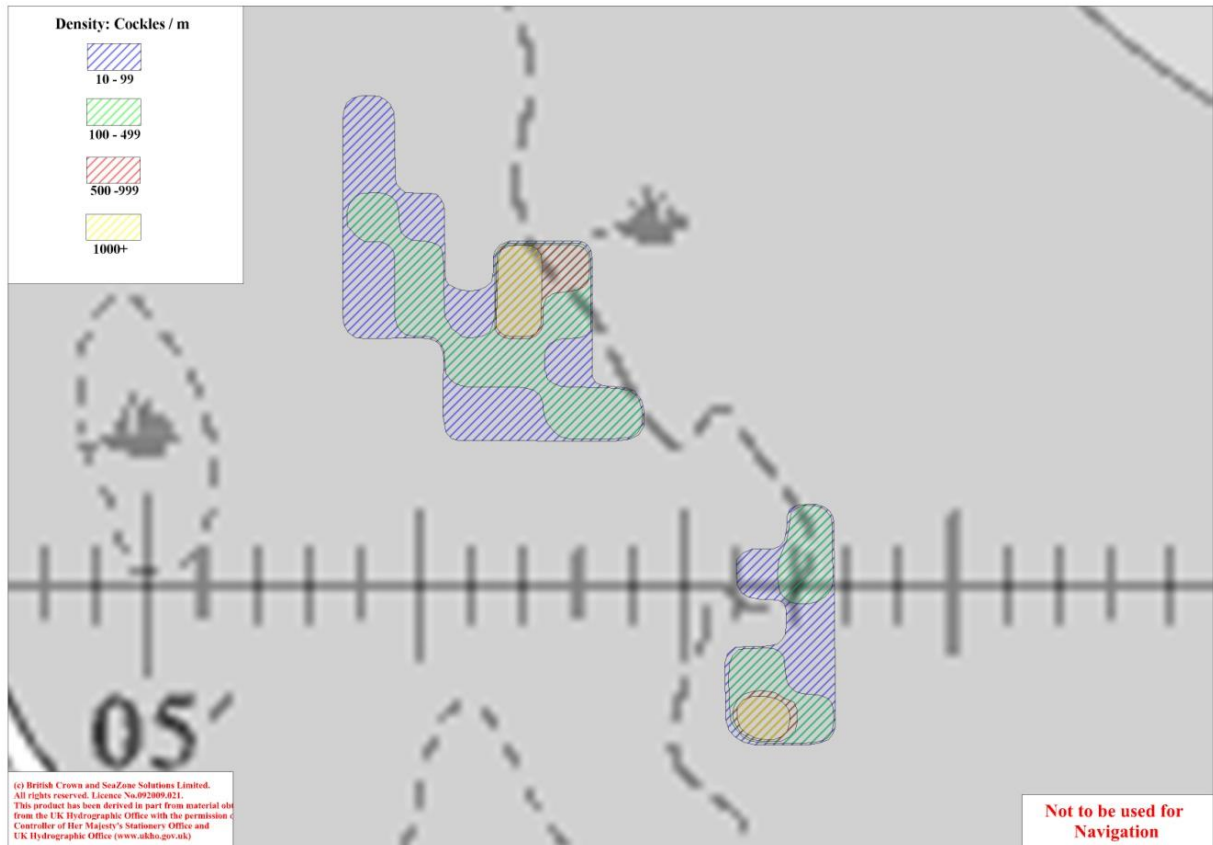


Figure 5. Distribution of cockle spat on all beds at Horseshoe Point in August 2013

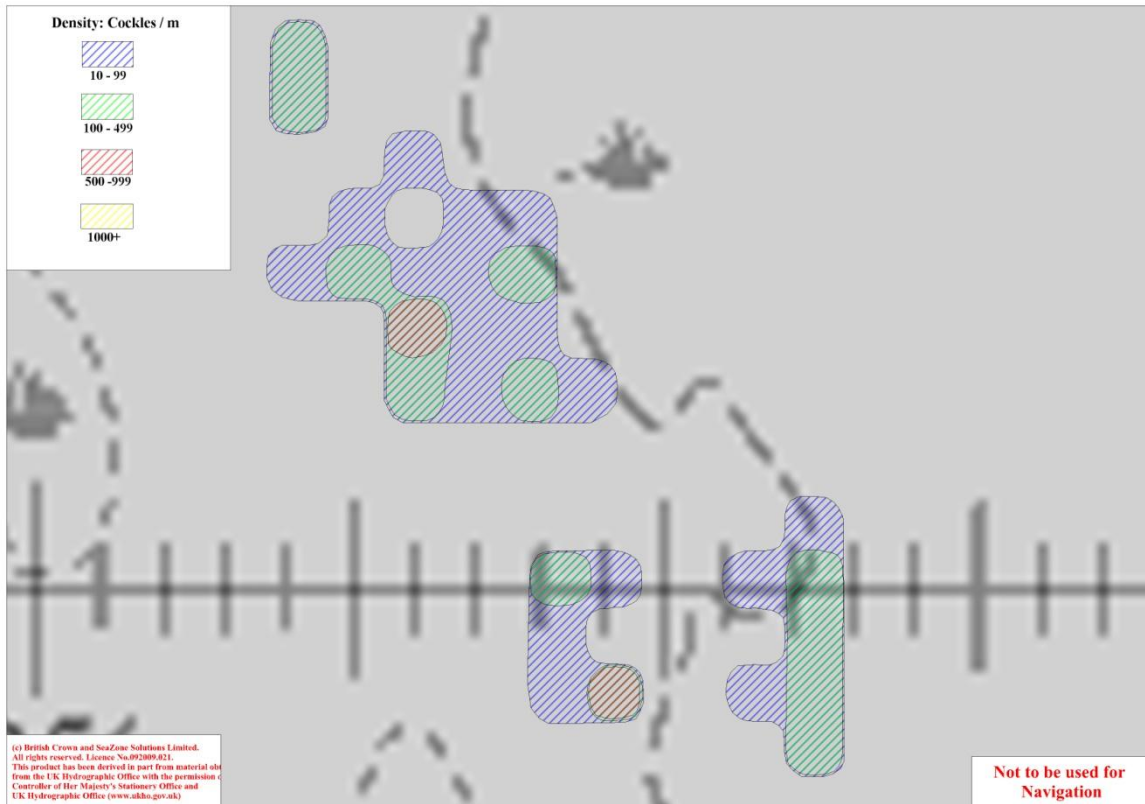


Figure 6. Distribution of <16mm cockles on all beds at Horseshoe Point in August 2013



Figure 7. Distribution of ≥16mm cockles on all beds at Horseshoe Point in August 2013

August 2014

Horseshoe Point

A summary of cockle stocks at the Horseshoe Point bed can be seen in table 7. A total of 562t was discovered, with 158t being adult stock (greater than 14mm in width), and 14t being 16mm or greater. Sub-14mm cockle covered 26.9ha of the bed, with a mean weight of 15.0t ha⁻¹, and a mean density of 658.9 cockles m⁻² (range 10-2352 m⁻²) (Fig. 8). Over 14mm cockle covered 26.6ha with a mean weight of 5.9t ha⁻¹, and a mean density of 165.2 cockles m⁻² (range 10-760 m⁻²) (Fig. 9). Over 16mm cockle covered 12.9ha with a mean weight of 1.1t ha⁻¹, and a mean density of 21.4 cockles m⁻² (range 10-60 m⁻²) (Fig. 10).

Table 7. Summary of the cockle stocks at the Horseshoe Point bed in August 2014

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
<14mm	404.0	658.9	15.0	26.9
≥14mm	158.0	165.2	5.9	26.6
≥16mm	14.0	21.4	1.1	12.9

Grainthorpe West

A summary of cockle stocks at the Grainthorpe West bed can be seen in table 8. A total of 60t was discovered, with 9t being adult stock (greater than 14mm in width), and 0.8t being 16mm or greater. Sub-14mm cockle covered 9.0ha of the bed, with a mean weight of 5.6t ha⁻¹, and a mean density of 317 cockles m⁻² (range 10-1030 m⁻²) (Fig. 8). Over 14mm cockle covered 4.7ha with a mean weight of 1.9t ha⁻¹, and a mean density of 26 cockles m⁻² (range 10-70 m⁻²) (Fig. 9). Over 16mm cockle covered 0.9ha with a mean weight of 0.9t ha⁻¹, and a mean density of 10 cockles m⁻² (range 10-10 m⁻²) (Fig. 10).

Table 8. Summary of the cockle stocks at the Grainthorpe West bed in August 2014

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
<14mm	51.0	317.0	5.6	9.0
≥14mm	9.0	26.0	1.9	4.7
≥16mm	0.8	10.0	0.9	0.9

Grainthorpe East

A summary of cockle stocks at the Grainthorpe East bed can be seen in table 9. A total of 316t was discovered, with 54t being adult stock (greater than 14mm in width), and 3t being 16mm or greater. Sub-14mm cockle covered 14.9ha of the bed, with a mean weight of 17.6t ha⁻¹, and a mean density of 1118 cockles m⁻² (range 20-5560 m⁻²) (Fig. 8). Over 14mm cockle covered 11.1ha with a mean weight of 4.9t ha⁻¹, and a mean density of 304.2 cockles m⁻² (range 10-1630 m⁻²) (Fig. 9). Over 16mm cockle covered 6.1ha with a mean weight of 0.5t ha⁻¹, and a mean density of 10 cockles m⁻² (range 10-10 m⁻²) (Fig. 10).

Table 9. Summary of the cockle stocks at the Grainthorpe East bed in August 2014

Width (mm)	Tonnage	Mean Density (cockles m ⁻²)	Mean Weight (t ha ⁻¹)	Area (ha)
<14mm	262.0	1118.0	17.6	14.9
≥14mm	54.0	304.2	4.9	11.1
≥16mm	3.0	10.0	0.5	6.1

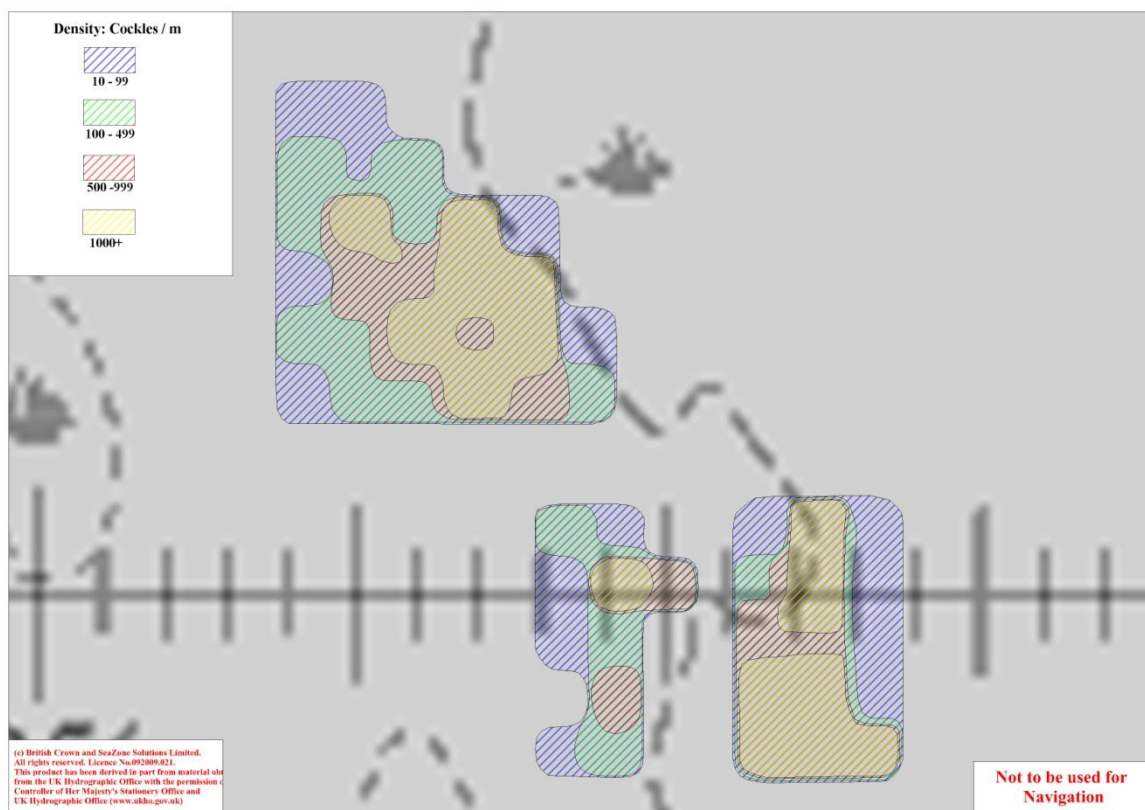


Figure 8. Distribution of <14mm cockles on all beds at Horseshoe Point in August 2014

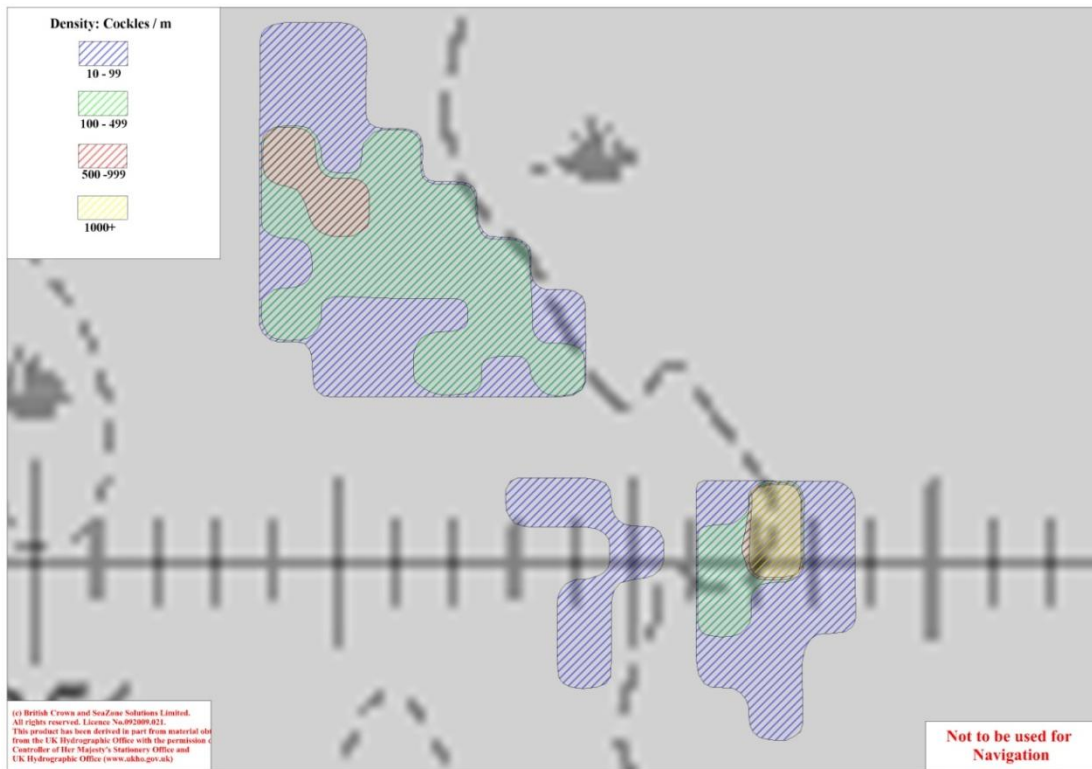


Figure 9. Distribution of $\geq 14\text{mm}$ cockles on all beds at Horseshoe Point in August 2014



Figure 10. Distribution of $\geq 16\text{mm}$ cockles on all beds at Horseshoe Point in August 2014

PROTECTED AREA BYELAW
Regulatory Notice 4: Eelgrass (*Zostera*) - Fishing restrictions

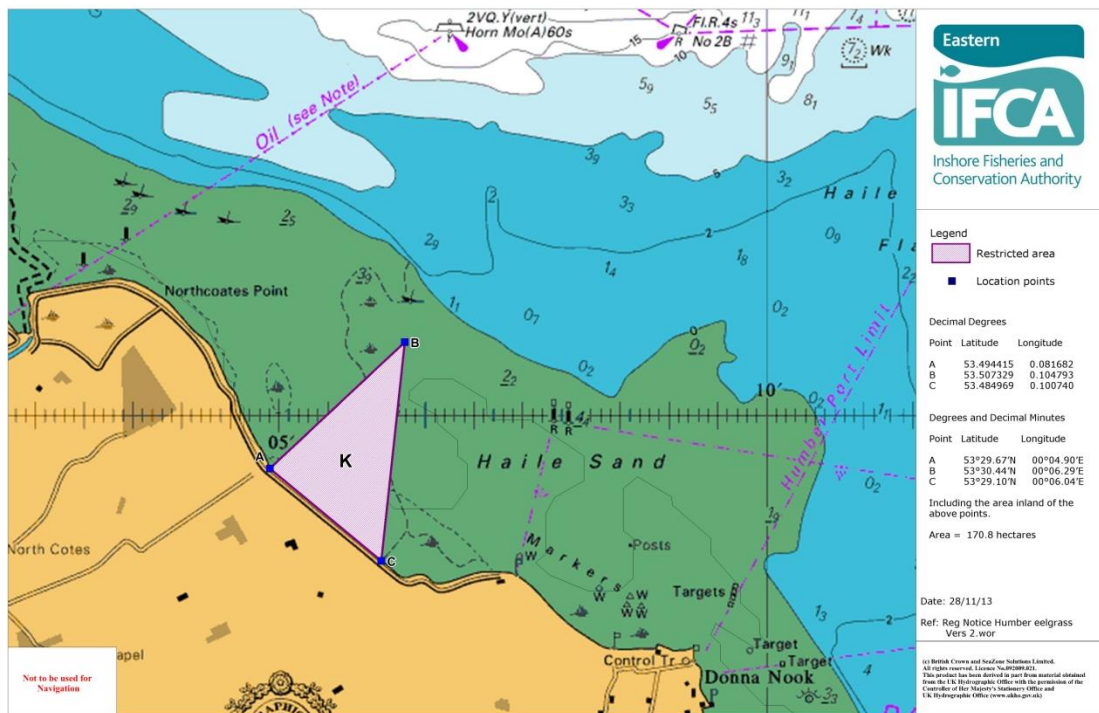


Figure 11. Location of the eelgrass closed area at Horseshoe Point

2014 Stock summary

An overall stock summary for the three beds at Horseshoe Point can be seen in table 10. Stock is summarised for both total stock, and stock outside the area closed due to the presence of eelgrass, which can be seen in figure 11. The Horseshoe Point bed contained the most stock at 562t with 526t outside the closed area, while Grainthorpe West contained the least at 60t. Additionally cockle was least dense at Grainthorpe West, and 0t was outside of the closed area. Grainthorpe East contained 316t of cockle, of which 162t was outside the closed area, and was also the most densely stocked of the three beds (tables 7, 8, 9). On the three beds, a total of 938t of cockle was present, with 688t outside of the closed area.

Table 10. Overall stock summary in and out of closed area at Horseshoe Point in August 2014

Bed	Total Stock (t)	Stock outside closed area (t)
Horseshoe Point	562	526
Grainthorpe West	60	0
Grainthorpe East	316	162
Total	938	688

Size and year class distribution

February 2013

The size and year class distribution for all three beds in February 2013 can be seen in figure 12. Cockles ranged in width from 4-23mm, and distribution was dominated by larger cockles of years 2011 and 2010. At the Horseshoe Point bed, 8% of individuals were year 1, 32% were year 2, 58% were year 3, and 2% were year 5. The modal width of cockles at Horseshoe Point was 13mm. At Grainthorpe West, 22.2% of individuals were year 1, 72.2% were year 2, and 5.6% were year 3. The modal width of cockles at Grainthorpe West was 14mm. At Grainthorpe East, 41.7% of individuals were year 1, and 58.3% were year 2. The modal width of cockles at Grainthorpe East was 15mm.

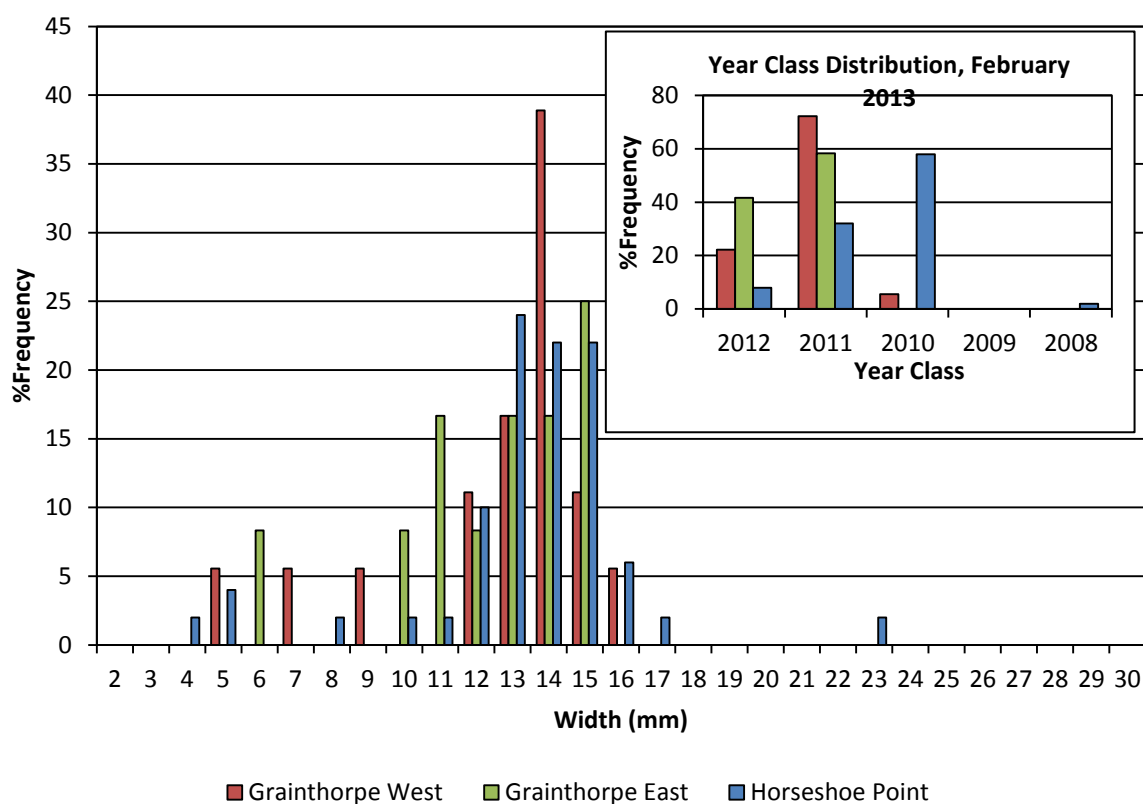


Figure 12. Size and year class distributions of cockles at the three beds at Horseshoe Point in February 2013

August 2013

The size and year class distribution for all three beds in August 2013 can be seen in figure 13. Cockles ranged in width from 2-20mm, and distribution was dominated by cockles of years 2013 at Grainthorpe East and Horseshoe Point and 2012 at Grainthorpe West. At the Horseshoe Point bed, 91.1% of individuals were year 0, 8.5% were year 1, 0.4% were year 2, and <0.1% were year 3. The modal width of cockles at Horseshoe Point was 5mm. At Grainthorpe West, 6.5% of individuals were year 0, 85% were year 1, and 8.4% were year 2. The modal width of cockles at Grainthorpe West was 9mm. At Grainthorpe East, 95.5% of individuals were year 0, 4.2% were year 1, and 0.3% were year 2. The modal width of cockles at Grainthorpe East was 5mm.

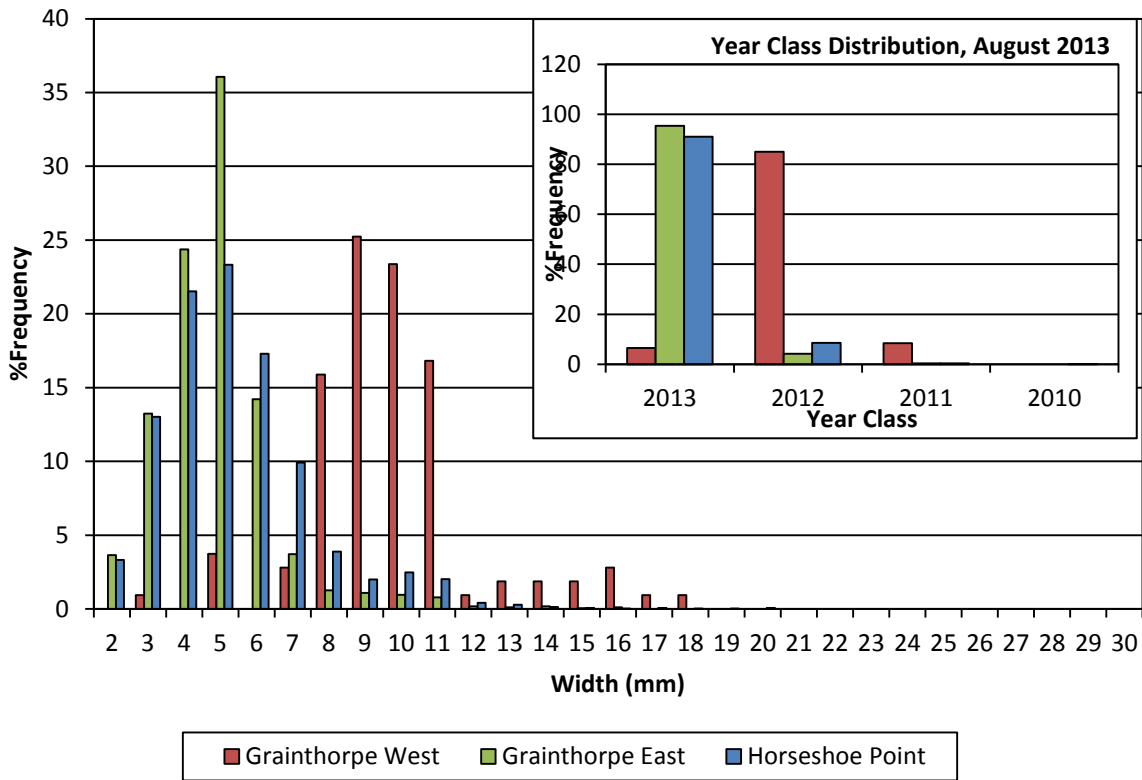


Figure 13. Size and year class distributions of cockles at the three beds at Horseshoe Point in August 2013

August 2014

The size and year class distribution for all three beds in August 2014 can be seen in figure 14. Cockles ranged in width from 3-21mm, and distribution was unimodal at all three beds owing to the dominance of year 1 (2013) cockles and relatively low numbers of year 0 (2014) and year 2 (2012) cockles. At the Horseshoe Point bed, 98.9% of individuals were year 1, 0.7% were year 0, and 0.4% were year 2. The modal width of cockles at Horseshoe Point was 12mm. At Grainthorpe West, 96.7% of individuals were year 1, 1.3% were year 0, and 0.2% were year 2. The modal width of cockles at Grainthorpe West was 11mm. At Grainthorpe East, 98.5% of individuals were year 1, 1.3% were year 0, and 0.2% were year 2. The modal width of cockles at Grainthorpe East was 10mm.

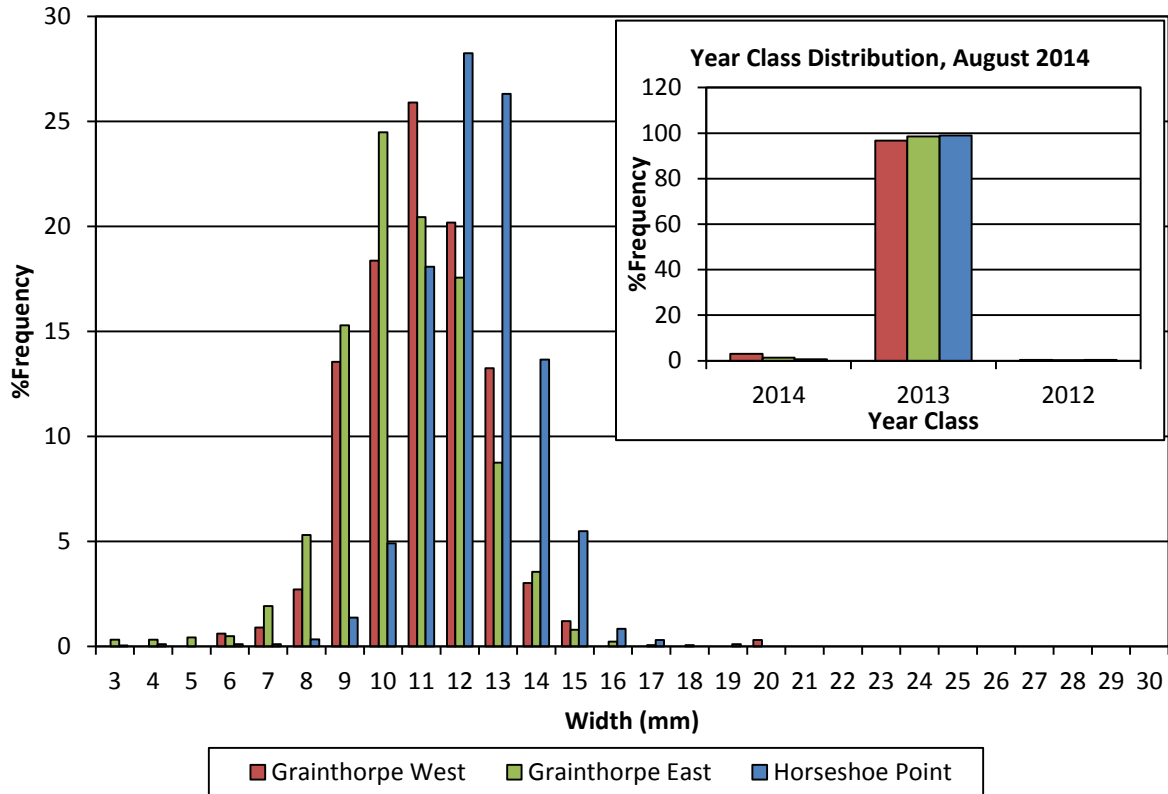


Figure 14. Size and year class distributions of cockles at the three beds at Horseshoe Point in August 2014

Historic data

Horseshoe Point cockle stock data from the beginning of Eastern IFCA’s surveys in January 2011 up to present for all three beds combined are presented in table 11. It can be seen that levels of spatfall are relatively consistent (spat was not recorded separately in 2014 for reasons outlined in the discussion) throughout the years, but survival through to subsequent years is relatively low, with the exception of the 2013 spatfall which has survived thus far to provide the unusually large stocks of year 1 cockles on the beds at present. If size classes excluding $\geq 16\text{mm}$ are condensed into sub-16mm including spat then stocks in August 2014 were 920.2t compared to 110.2t in August 2013, more than an eight-fold increase.

Table 11. Historic and current cockle stocks at all three beds combined. * Denotes not applicable; division of size class data has varied year-on-year, and data was not recorded separately for spat in 2014. See discussion for further details

	Jan 2011	Aug 2011	Jan 2012	Feb 2013	Aug 2013	Aug 2014
Year 0 (spat)	46t	26t	48.5t	*	55.2t	*
<14mm	3.1t	36.7t	1.2t	3.6t	*	717t
<16mm	*	*	*	*	55t	*
$\geq 14\text{mm}$	19.7t	42t	1.7t	7.8t	*	221t
$\geq 16\text{mm}$	17t	14.5t	1.2t	1.9t	8.3t	17.8t

Discussion

Since acquiring responsibility for the cockle beds in the Horseshoe Point area from North Eastern IFCA, Eastern IFCA have conducted surveys to determine stock levels and population composition beginning in January 2011. Surveys have been conducted twice annually where possible in the winter and in the summer. Historic stock summaries presented here show that the beds regularly attract high levels of spatfall, primarily on the Horseshoe Point bed, but then suffer high mortalities with little surviving to become adult stock. In the absence of a long-term data set it is however impossible to tell if this is an on-going annual trend or whether recruitment has simply been low in the last few years due to unknown factors. It has been suggested the lack of a fishery or major disturbance events is indicative that the stocks may be suffering similar mortality events as those seen in the Wash (Jessop *et al*, 2011), as can be seen in table 5, which shows adult stock declining by more than 90% from August 2011 to January 2012. Moribund cockles have been observed by Eastern IFCA staff at Horseshoe Point during the 2012 survey which supports this notion.

As mentioned in the results, some discrepancies exist in the data gathering between survey years. In the past, methods used in the Wash cockle surveys were followed directly, meaning that size classes were divided into <14mm (generally regarded as juvenile), ≥14mm (minimum landing size for the Wash) and ≥16mm (high commercial value and generally preferred given availability), and spat if present in large enough numbers. At Horseshoe Point, the minimum landing size is any cockle which will pass through a 20mm square, which roughly equates to a cockle of 16mm width (Ron Jessop, Per. Comm.). In 2003, it was decided that size classes for Horseshoe Point should be changed to reflect the different minimum landing size to the Wash, and so categories were changed to <16mm, ≥16mm, and spat where applicable. Following a staff changeover, this new method was not carried over to 2014, which resulted in the discrepancy. It is likely that the new method will be reinstated in future surveys.

Past surveys have found that cockles extend outside of the areas originally designated by North Eastern IFCA (then North Eastern Sea Fisheries Committee) in 1996, and the northern part of the Horseshoe Point bed consists of coarse sand unsuitable for supporting cockles. It may therefore be pertinent to review the survey area in the future to be more reflective of where the beds now lie. In addition, a cockle prospector spoke to the survey team during the 2014 survey who claimed that he had found larger cockles in acceptable quantities some distance seaward of the survey sites. In 2012, an attempt was made by eastern IFCA to conduct a boat-based cockle survey at Horseshoe Point in order to cover a far wider area than the foot surveys, however it proved unsuccessful as the vessel was only able to reach a few of the proposed sites at the lowest part of the shore (Jessop *et al*, 2012).

Typically, cockles at Horseshoe Point are fast growing and upon surviving two winters will typically have reached commercial size. In order for a cockle fishery to be viable, there must be a sufficient number of cockles present of minimum landing size or greater, which equates approximately to 1.5t ha⁻¹ (Ron Jessop, Pers. Comm.). In the recent past, survival of spat at Horseshoe Point into adulthood has been too low to allow a viable fishery. The 2014 survey has however revealed that the 2013 spatfall at the beds has survived in great numbers. Although at the time of survey these cockles were all juvenile, their mean size was approaching that of adult stock, and on the assumption that a significant proportion survives the winter of 2014/15, it is likely they will have grown to commercial size in sufficient density for a fishery to be viable.

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