

NWIFCA Technical, Science and Byelaw Committee

31st October 2017: 10:00 a.m.

**AGENDA
ITEM NO.
8**

Report to TSB on Cockle and Mussel Fisheries

Purpose: to provide an update on the District's cockle and mussel fisheries.

Recommendation:

- i. that the report be approved;
- ii. that Members approve the closure of the Leasowe cockle fishery at midnight on 2ND December.

Science and Stock Report:

Science Officers have had a busy quarter with cockle and mussel surveys, as well as providing IFCOs with assistance in enforcement and with sample runs (for shellfish hygiene testing). Due to the nature of the fisheries the Bivalve Mollusc Working Group has not been convened: any correspondence necessary has been carried out via email.

The first part of this report focusses on the detail of science involvement in the active fisheries; while Annex A provides the quarter's survey results.

1. Cockle Fisheries

i (a). Wirral - Leasowe Cockle Fishery

Following survey and stock assessment it was concluded that abundance and density of cockles had persisted to a level that a commercial fishery could proceed, providing management could be arranged to ensure the fishery was HRA compliant, mainly in relation to bird disturbance and bird prey resource. Science Officers attended and contributed to multi-agency meetings in the planning of the fishery and had close dialogue with Natural England colleagues to agree the HRA. In order to ensure sufficient cockle prey food resource remained on the bed through the winter for the SPA birds, a TAC of 2632 tonnes was set. The calculations used for setting this TAC are detailed in the HRA, which is available to Members and has been published on the website. Officers built in a buffer to ensure the TAC was not surpassed, whereby close observation of IFCO reports, dialogue with merchants and scrutiny of landings would trigger re-survey once 2408 tonnes (ie 80% of the TAC) had been taken.

Science Officers assisted in the first days of the fishery with enforcement on the bed, and also drew up an information leaflet to hand out to members of the public, which enabled us to engage in PR on the prom. Officers also carried out engagement with 'recreational' gatherers on the bed, ensuring they were aware of the MLS and the Byelaw regulations – ie. only 5kg per person per day permitted to be removed. The Senior Scientist has also been responding to emails when members of the public have raised any concerns around the fishery. The main issue is littering, which includes cockle bags and drinks bottles being left out on the bed. These wash up on to the foreshore when the tide comes in. It is one aspect of this kind of fishery that must be addressed. The Senior Scientist spent some time on the bed amongst the fishermen reminding them to take all their rubbish off the beach. One buyer did take responsibility when asked and immediately sent one of his support workers out to collect the rubbish. However it should not be necessary to ask, and Officers should not have to be spending time sorting this out.

Science Officers have also been asked to contribute to a conversation between industry and Cefas / FSA (Food Standards Agency) on classification of the cockles. Cefas set their sampling positions (RMPs) based on worse-case scenarios, and usually position them close to riverine influence. Full details of the work used can be found in the Sanitary Surveys (<https://www.cefas.co.uk/cefas-data-hub/food-safety/sanitary-surveys/>). Industry had asked for the RMP to be changed to nearer the main fishery area – ie. further away from the river, which could possibly result in a better classification (lower e-coli results). The problem lies in the fact that the extent of the cockle bed is not restricted to the main fishery area but extends down to the existing RMP. It would prove extremely problematic to prove where cockles had been taken from if there were two separately classified zones, especially considering much of the fishing activity is taking place during the hours of darkness.

As members are aware each fishery has its own peculiar characteristics, which is not necessarily fixed but can change seasonally and annually. It is interesting to note that the main dense area of cockles at Leasowe was extremely muddy at the start of the fishery. However following a couple of days of strong winds the ground hardened up somewhat, making the fishing harder going than it had been (reports of blisters from fishermen!) There have also been reports of cockles of a different colour, suggesting a different stock, ‘washing up’ on the beach, so there is a possibility they are coming in from elsewhere.

i (b). **Leasowe Cockle Fishery recommendation for closure – results from survey 18th October 2017**

A further stock survey was carried out on 18th October with results provided in Annex A. As might be expected following fishing and considerable high winds since the fishery opened, much of the cockle from the dense area has spread out towards the north-east. The cockle is growing very quickly (this is 2017 settlement); there was very little undersize cockle in the samples removed with an estimated biomass of only 24 tonnes remaining on the bed. When last surveyed in August the majority of the size cockle was only just size (~27mm shell length) – whereas now a significant proportion has reached the 30-40mm size range. Estimated biomass of size cockle remaining = 1366 tonnes.

This is less than was predicted when taking landings returns (~ 1000 tonnes) into consideration and therefore the original TAC (2632 tonnes) needs to be reconsidered. This could be explained by a number of factors:

- bird predation – large groups of birds have been observed feeding on the cockles each time the fishery has been inspected;
- wash out from wind and weather conditions;
- natural mortality;
- under-reporting of landings.

Members are asked to consider the need to set a date for the closure of this fishery to ensure sufficient cockle food remains on the bed for the over-wintering birds and that management of the fishery remains HRA compliant. The original assessment required a total of 891 tonnes size and 293 tonnes u/s to be left for the birds. This was incorporating bird feeding requirements (BFR) from beginning of September to end of March ie. 7 months, the key bird times for bivalve eating waders.

With two months passed and now looking at requirements for the 5 remaining:

BFR for 5 months:

SIZE:	891 / 7 (months) = 127 tonnes per month x 5	= 635 tonnes for 5 months
U/SIZE:	293 / 7 (months) = 42 tonnes per month x 5	= 210 tonnes for 5 months

Overall BFR Total: 845 tonnes

As there is so little undersize remaining (which will not get fished) the calculations have taken the survey biomass as a total of combined sizes, giving:

TOTAL BIOMASS REMAINING = 1390 TONNES

minus BFR (845T) gives **fishable amount = 545 TONNES**

Members could decide to allow fishing to continue until returns indicate that this amount has been fished. However there is a risk of under-reporting if taking this approach, and therefore it is recommended to set a closure date based on the following maximum predictions, which are based on the most recent information on activity from IFCOs (20th Oct. 2017):

Max 20 persons fishing a tide getting 300kg per tide = 0.3 tonnes x 20 = 6 tonnes per tide max.
If they all double tide = 12 tonnes per day.
If they all fish every day, taking 12 tonnes per day from fishable biomass of 545 tonnes (545 / 12 = 45) gives 45 days remaining until BFR biomass of 845 tonnes is reached.

Taking the start date as 19th October (day after survey) 45 days runs until 2nd December.

- Recommendation:**
- i. **that Members approve the closure of the Leasowe cockle fishery at midnight on 2nd December 2017;**
 - ii. **that fishing activity is closely monitored and should it increase above that predicted that this date is reviewed, an alternative earlier date produced, and approval to close earlier is gained through email correspondence with TSB.**

ii. Ribble Estuary - Penfold North

Although the soft muddy ground at this fishery makes survey difficult, officers worked to cover as much of it as possible to provide a stock assessment (Annex A). These cockles are very slow growing but abundance and density have persisted. However only around 10% is size and the ground is so muddy and water is lacking that riddling out the undersize would be highly problematic, and there would be a risk of damage to the undersize stock. Samples have been collected during the hygiene sampling runs and measured. It is evident that large proportions of the cockle remain undersize (~ 90%) but with a high percentage (~85%) in the 20-26mm range, with size cockle generally 27mm+.

A further survey is scheduled for 24th October and results will be provided at TSB. If substantial stock has now reached size and is sufficient to allow a fishery while remaining HRA compliant, Officers will be asking TSB for approval to open this fishery (lift NWSFC Byelaw 13a closure).

iii. Morecambe Bay – Pilling Sands & Flookburgh / Leven Sands

Survey and stock assessments were carried out on these three beds (Annex A), and an HRA was completed for Morecambe Bay (rather than individual beds). No TAC was set as there are sufficient alternative cockle beds that are not open to fishing, and mussel stocks for bird feeding. These are being monitored, and should stock be dramatically lost Officers will seek to take action. The main concern was about potential risk to saltmarsh habitat at West Plain (Flookburgh) and disturbance to birds roosting there, should parking and / or tonning up occur there. It was anticipated that the majority of industry interest would initially focus on Leasowe, and that the one buyer at Flookburgh had made arrangements to use the airfield. Once into October when the first flurry of activity at Leasowe had settled down, more buyers turned to Flookburgh. IFCOs alerted Science team to the fact that some had taken their tonning up operation out on to the bed. The Senior Scientist immediately emailed those involved pointing out that this activity could render the fishery non-HRA compliant due to increased disturbance to birds feeding out the bed and requested that they desist. It is satisfying to be able to report that the buyers reacted favourably and moved to the airfield.

Activity at Pilling is expected to be low level as in previous fisheries. There is a similar issue over classification, as until recently the RMP could not be reached due to soft ground and an alternative sample position (as close to the RMP as possible) has been being used. However now the ground has hardened somewhat and it is possible to get to the RMP, and there are some cockles in the area. Industry are discussing the options with Cefas, FSA and Wyre Environmental Health.

iv. All other cockle beds

There are no other commercial stocks at present, but Officers and IFCOs will monitor for spat settlement.

2. Mussel Fisheries

i. Dee Estuary – size mussel

Officers worked with industry to carry out an inspection of dense mussel stock in the Dee estuary. Basically mussel is recruited to the hard substrate provided by cockle shell and dying cockle and is positioned within the cockle bed areas of the Dee Cockle Regulating Order, managed by NRW. Large swathes of cockle have one or two barnacles on their shell which prevents them from closing. As reported in Annex A, the ground is too soft and with deep mud to be able to walk all round it, so estimates have been made of the area and the biomass. Close discussion with NRW around inherited EA byelaws particularly around access was undertaken. All vehicular access is prohibited under the EA byelaws. Gatherers, which could include both B3 permit holders and those with Dee Transitional Permits, will take small boats out and dry out on the beds, fish around the boat and then return with the mussels on the flooding tide, in the same way the Dee Cockle Order licence holders fish. An HRA has been carried out (presently with NE for sign off), and activity levels are anticipated to be low. These and landings will be closely monitored. Cefas and FSA have agreed to use cockle sample results for classification purposes because the mussels lie within those classification zones. A sewage spill alert closed the fishery for seven days, but thankfully samples have been returned at normal levels, and the closure issued by the Local Authority has been lifted.

ii Morecambe Bay - Heysham Flat seed mussel

Following completion of the HRA which included an exclusion zone around the periphery of the skear to protect what little *Sabellaria alveolata* was there this year, an authorisation to fish was issued to B3 permit holders. Fishing began in August with a low level of activity (average 10 per day). Once the cockle fisheries were open on 1st September activity ceased.

The Senior Scientist witnessed fishermen in the exclusion zone during a heliflight in August. Legal action is being taken.

iii. Morecambe Bay – South America / Falklands seed mussel

No stock – no fishery.

iv. Morecambe Bay – Foulney and Low Bottom

Officers are monitoring stock which on last survey was very mixed in sizes, and IFCOs are reporting on activity, with none to date. It is possible that a low level of fishing for size mussel may occur during the winter. If fishing starts an HRA will be completed.

v. All other mussel beds

There are no other commercial stocks at present, but Officers and IFCOs will monitor for spat settlement in spring.

Annex A Cockle and Mussel Survey Reports

For all cockle surveys maps were created showing the overall survey area, density of size cockle, density of undersize cockle and the frequency of size classes (pie charts show the frequency of different size classes, (the size of the pie chart indicates the total density of cockles present).

Cockles – North Wirral Foreshore

Leasowe Survey 11-08-2017

Survey – Jumbo and 0.5m² quadrat / 0.1m² quadrat and sieve depending on substrate and density of cockle. 38 survey stations were sampled from a grid 250m apart with an extra point added between some points. The bed can be split into two distinct areas, one area high up the beach and relatively muddy that has a high density of cockle, and an outer area where the cockle has spread out from the dense and is in lower densities. This outer area consists of sand waves with muddy patches in between and the majority of the cockle lies in the muddy patches.

Means were calculated from all survey stations with the defined bed area (zero counts on the edge of the bed have been removed).

Dense Area

Mean number of size cockle: 396 per m² (min. 8, max 1430)

Mean number of undersize cockle: 102 per m² (min 0, max 510)

Outer Area

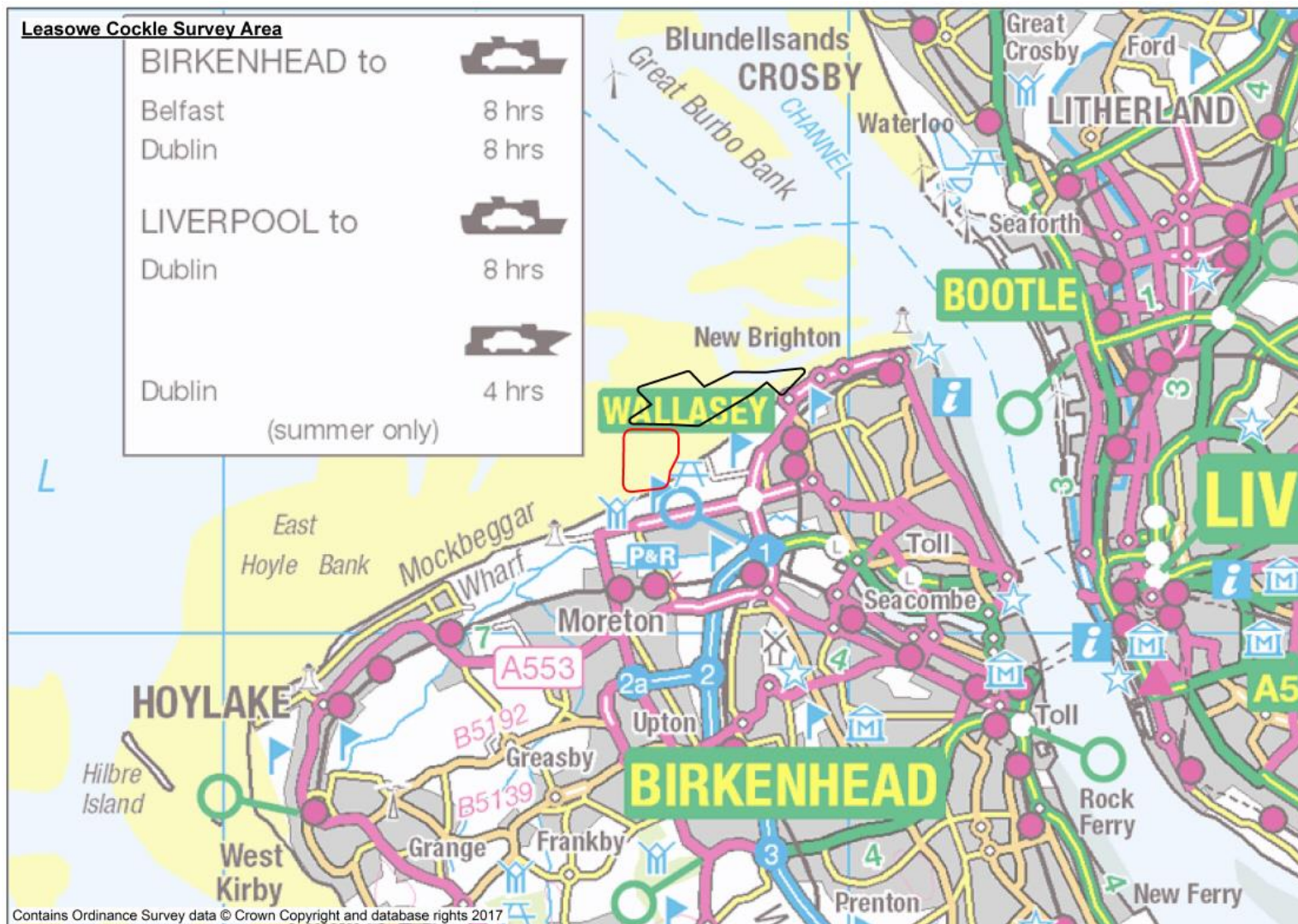
Mean number of size cockle: 34 per m² (min. 0, max 266)

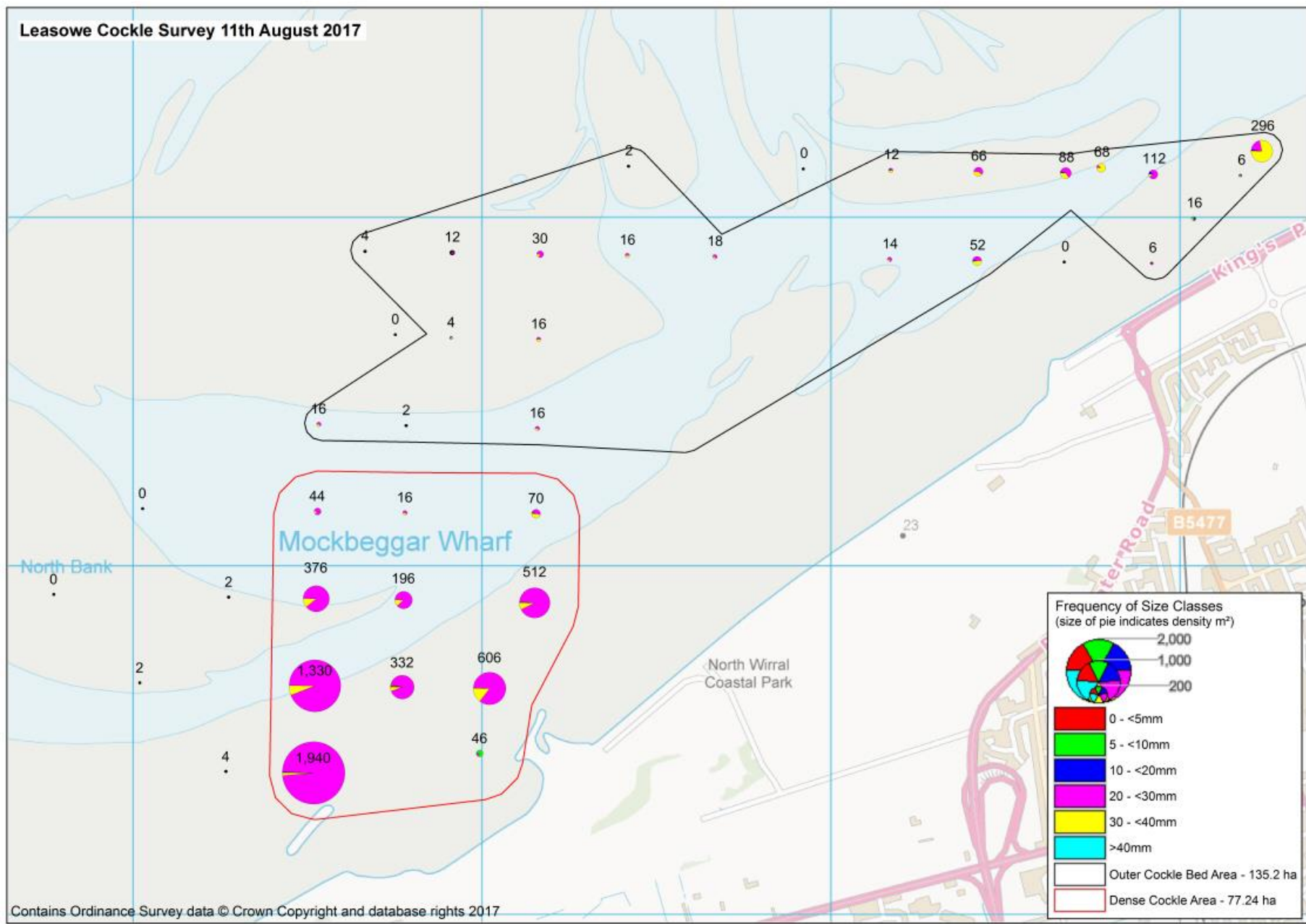
Mean number of undersize cockle: 3 per m² (min 0, max 30)

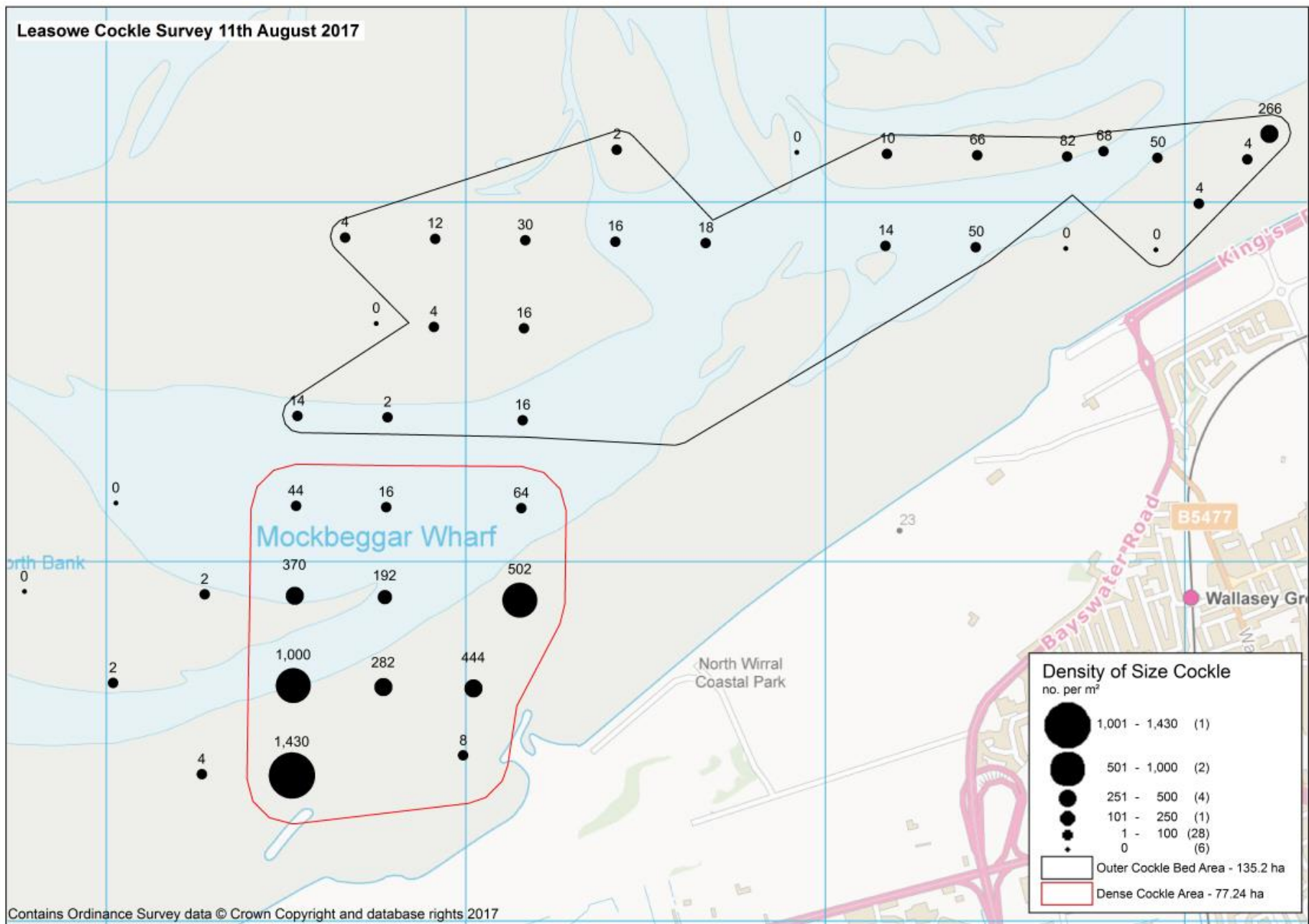
Biomass (Size cockle defined as cockle ≥ 27mm shell length).

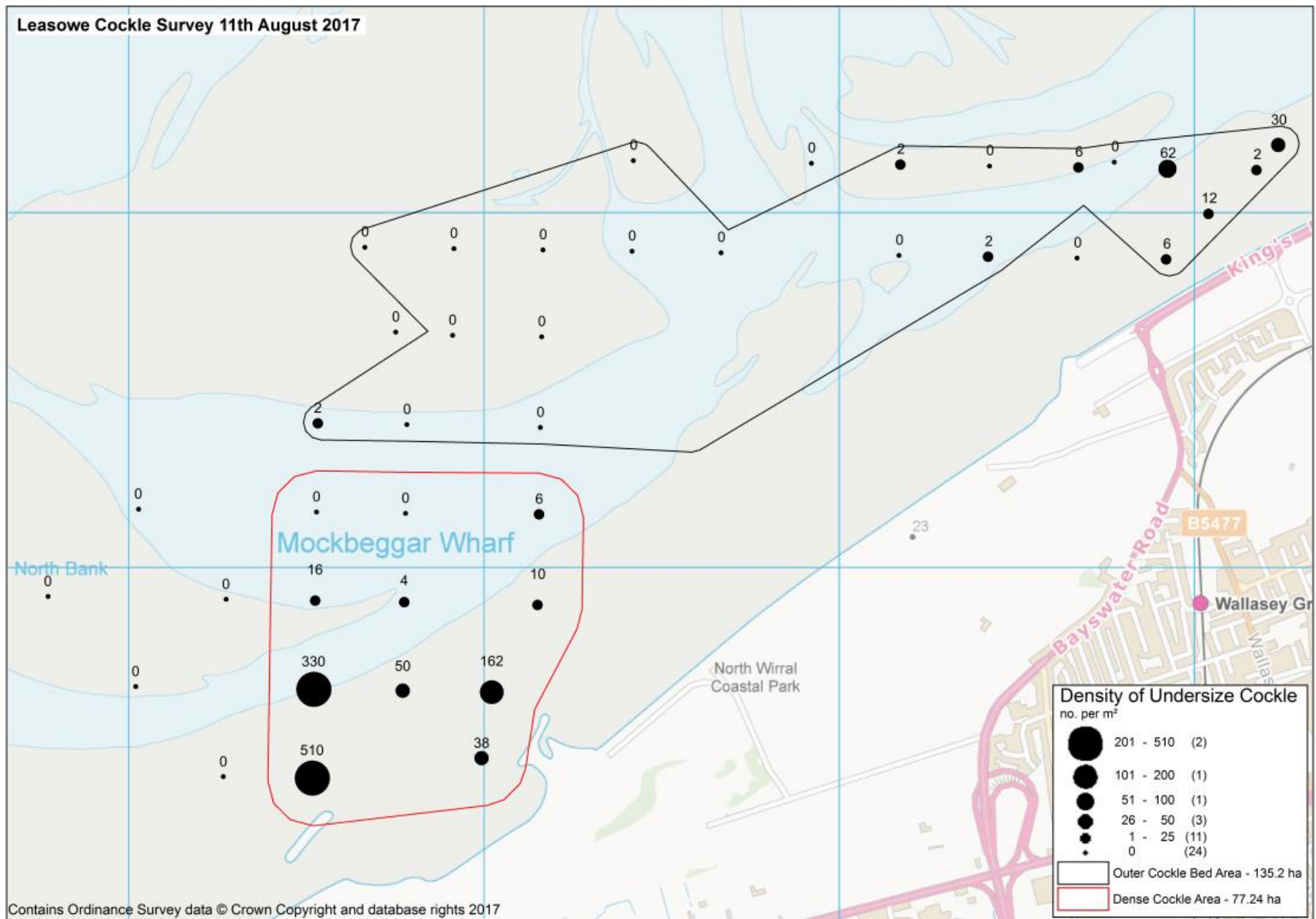
	Area (ha)	Size Cockle (tonnes)	Undersize Cockle (tonnes)
Dense Area	77.24	3007.9	271.9
Outer Area	135.20	515.6	20.9
<u>Total</u>	<u>212.4</u>	<u>3523.5</u>	<u>292.8</u>

Percentage of cockle in 20 – 30mm size range (from sub-sample of 100 cockles) just under size (ie. 24 – 26.99mm) = 32%.









Leasowe Survey 18-10-2017

Survey – Jumbo and 0.5m² quadrat. Forty-eight survey stations were sampled from a grid 250m apart with two extra points for full coverage. From the opening of the bed the density of the main area of cockle has reduced significantly from sites with 1000+ cockles to sites containing 50-150 cockles. The bed appears to have spread out in a north-easterly direction along the coast towards New Brighton. The area of the bed higher on the shore consists of cockles which are spread more consistently across the bed; whereas cockles on the lower shore sit in the muddy patches between higher sand waves.

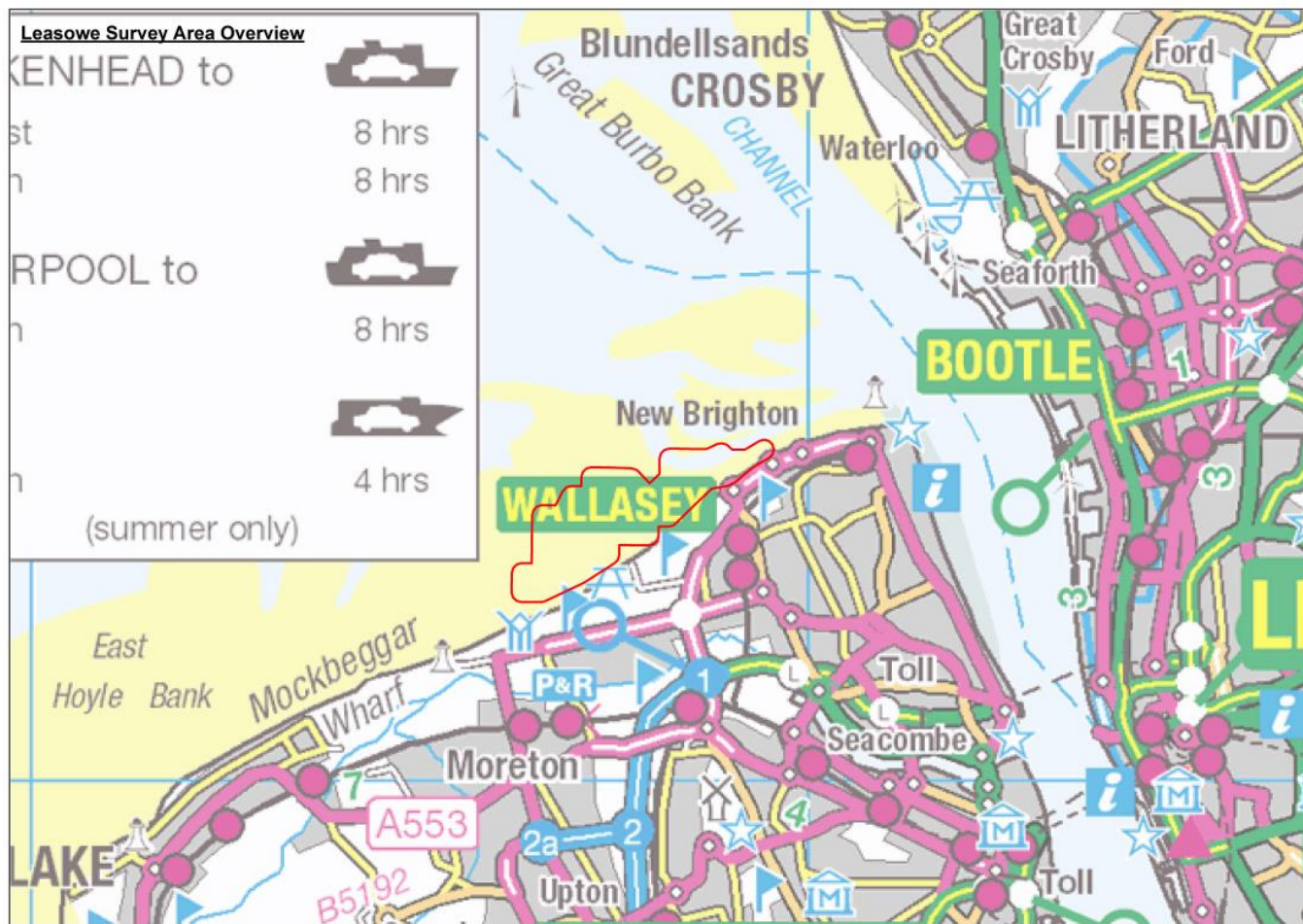
Means were calculated from all survey stations within the defined bed area (zero counts on the edge of the bed have been removed).

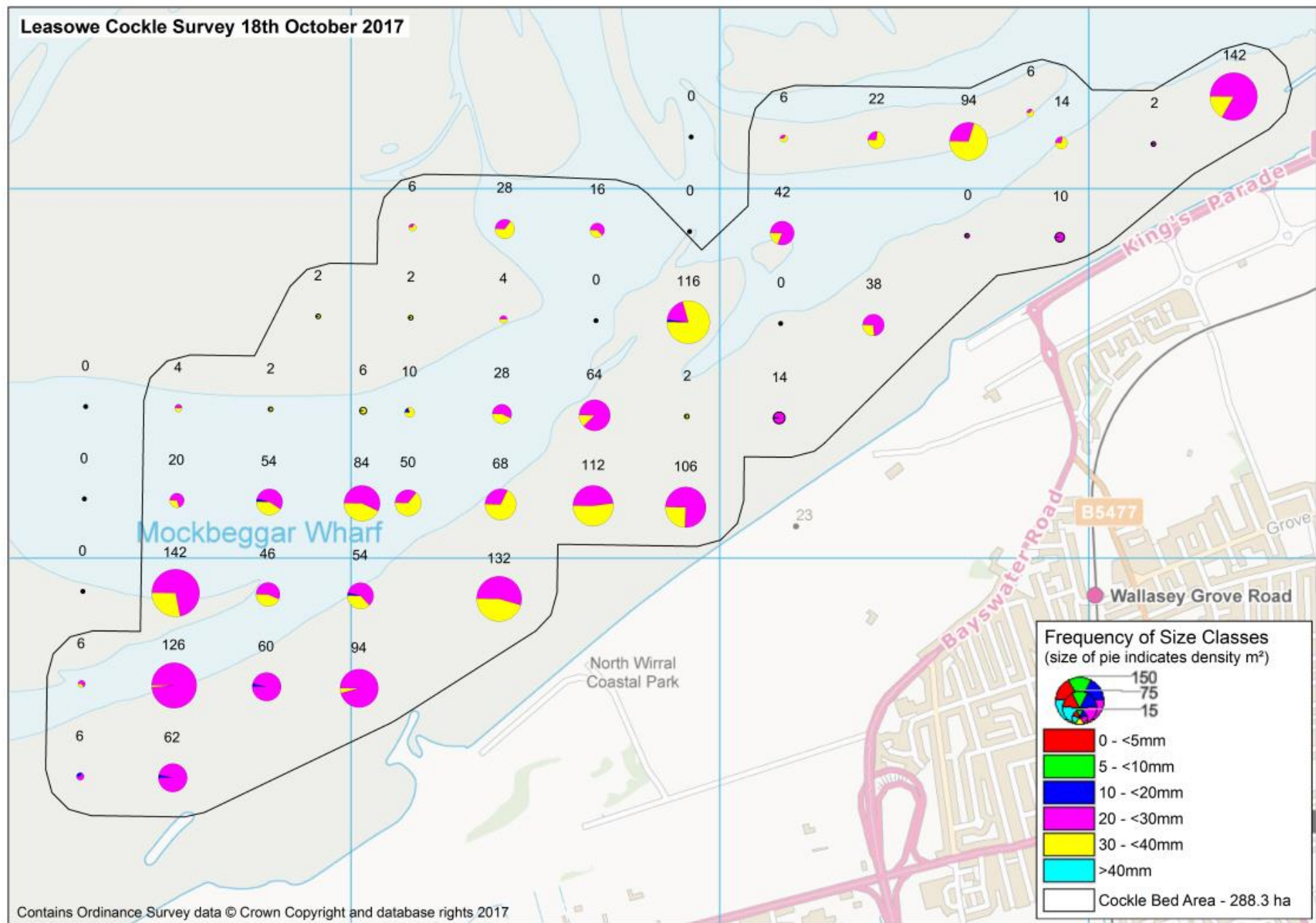
Mean number of size cockle: 41 per m² (min. 0, max 142)

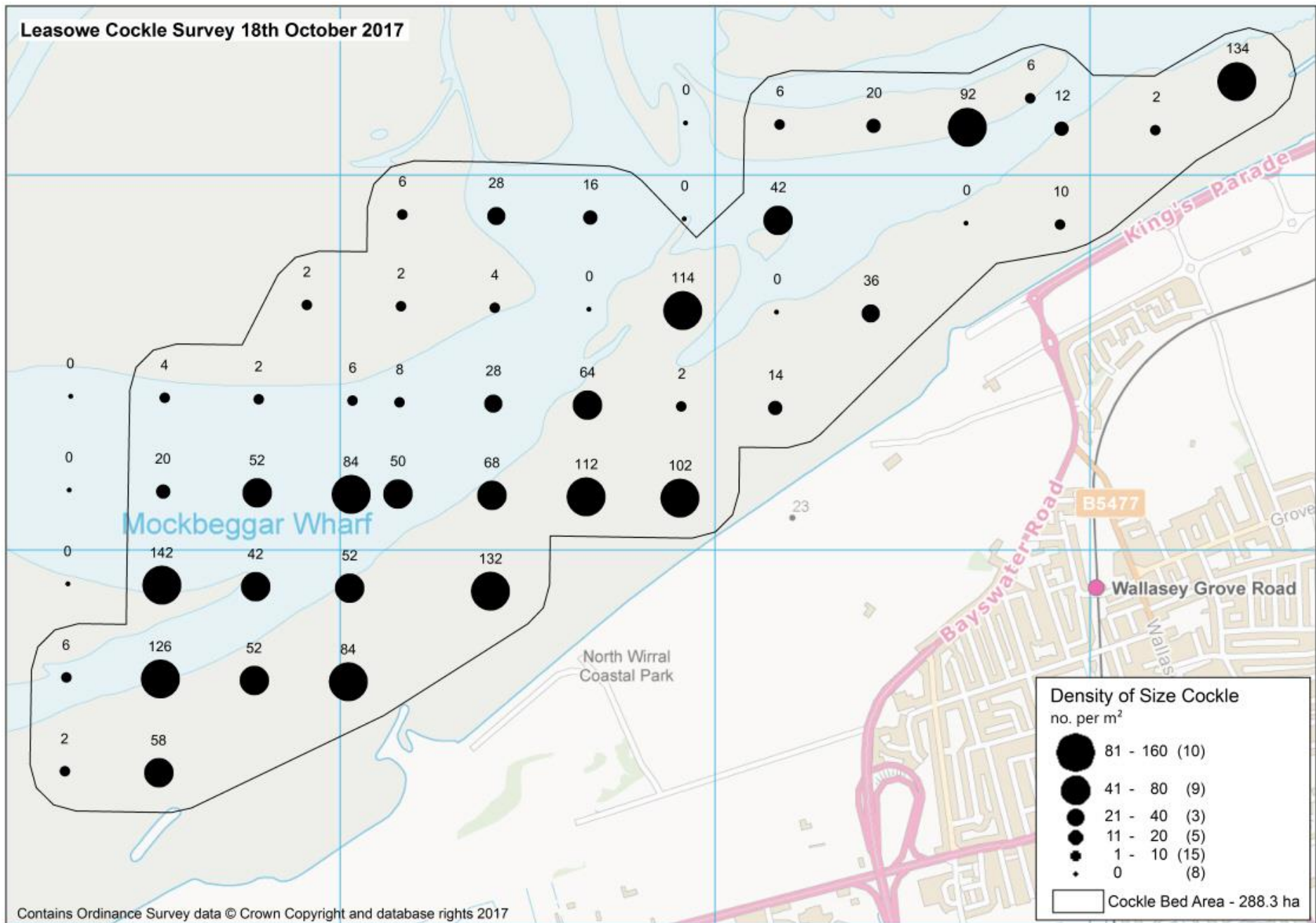
Mean number of undersize cockle: 2 per m² (min 0, max 10)

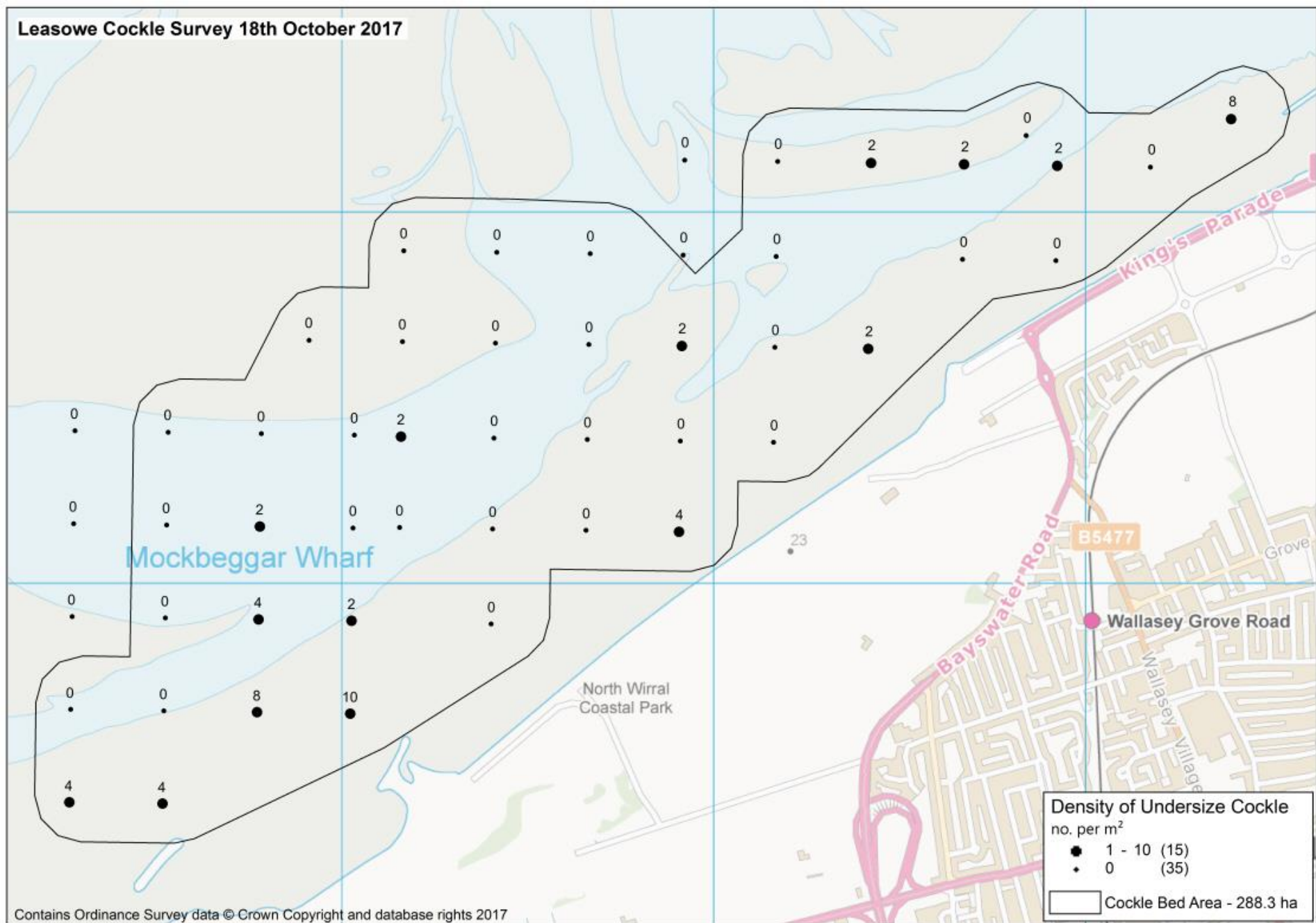
Biomass (Size cockle defined as cockle ≥ 27 mm shell length).

	Area (ha)	Size Cockle (tonnes)	Undersize Cockle (tonnes)
Leasowe	288	1366	24









'Hilbre Island' Survey 23-08-17

Survey method: Jumbo and 0.5 m² quadrat. The area was surveyed following a request from industry after a patch of cockles was found. Officers were led to the location of the patch and input survey stations around this. Survey stations were input at 150m intervals and extended down to low water. The denser area is around 10 ha in size, size cockle density ranged from 2 to 20 per m², undersized density from 0 to 2 per m². Cockles in the surrounding area were sparse. No mapping was produced due to the lack of stock present in the area.

Cockles – Morecambe Bay

Flookburgh Survey 25/07/2017 and 26/07/2017

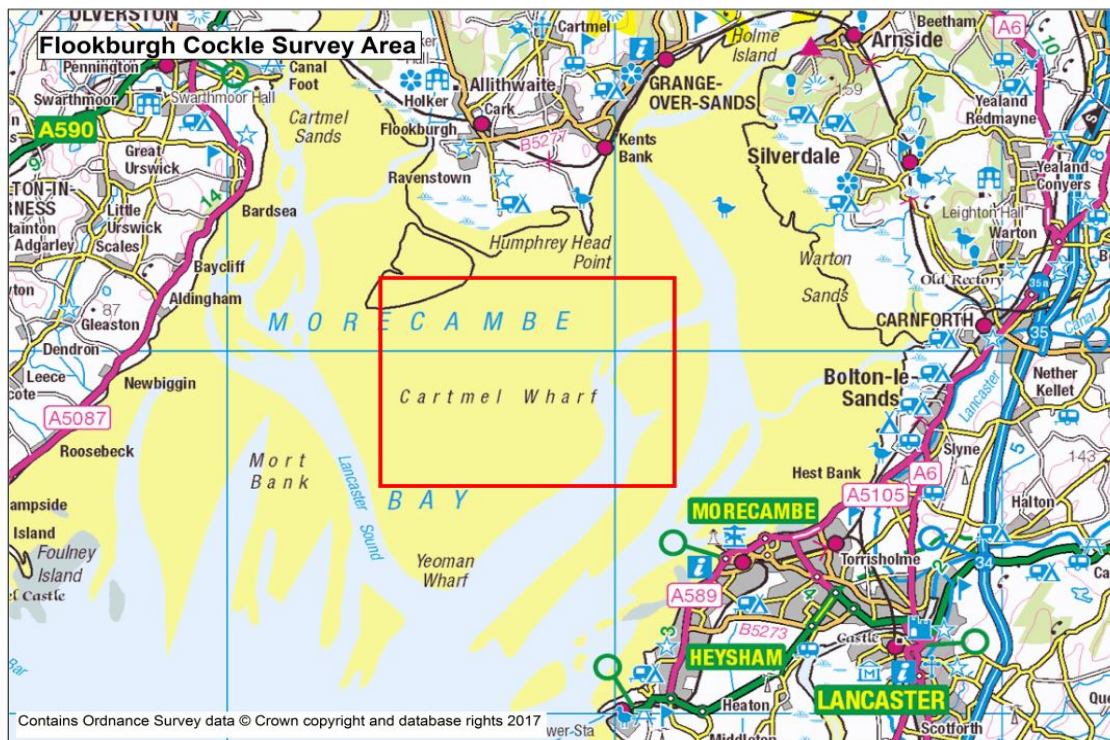
Due to the large area of the bed the survey was split over two days.

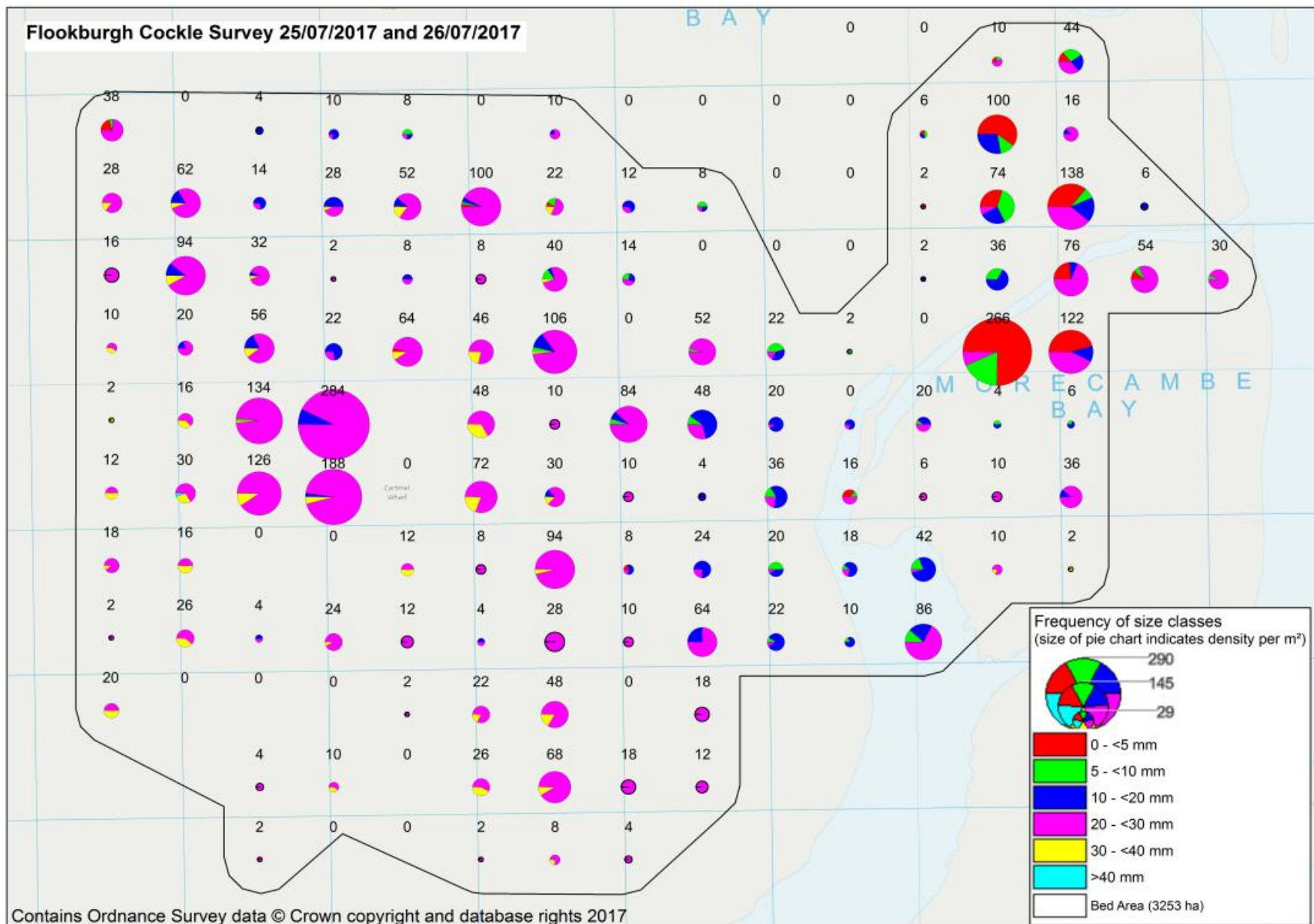
Survey method: Jumbo and 0.5m² quadrat. 159 survey stations were sampled in total from a grid with stations 500m apart. Means were calculated from all survey stations from both surveys with the defined bed area (zero counts on the edge of the bed have been removed).

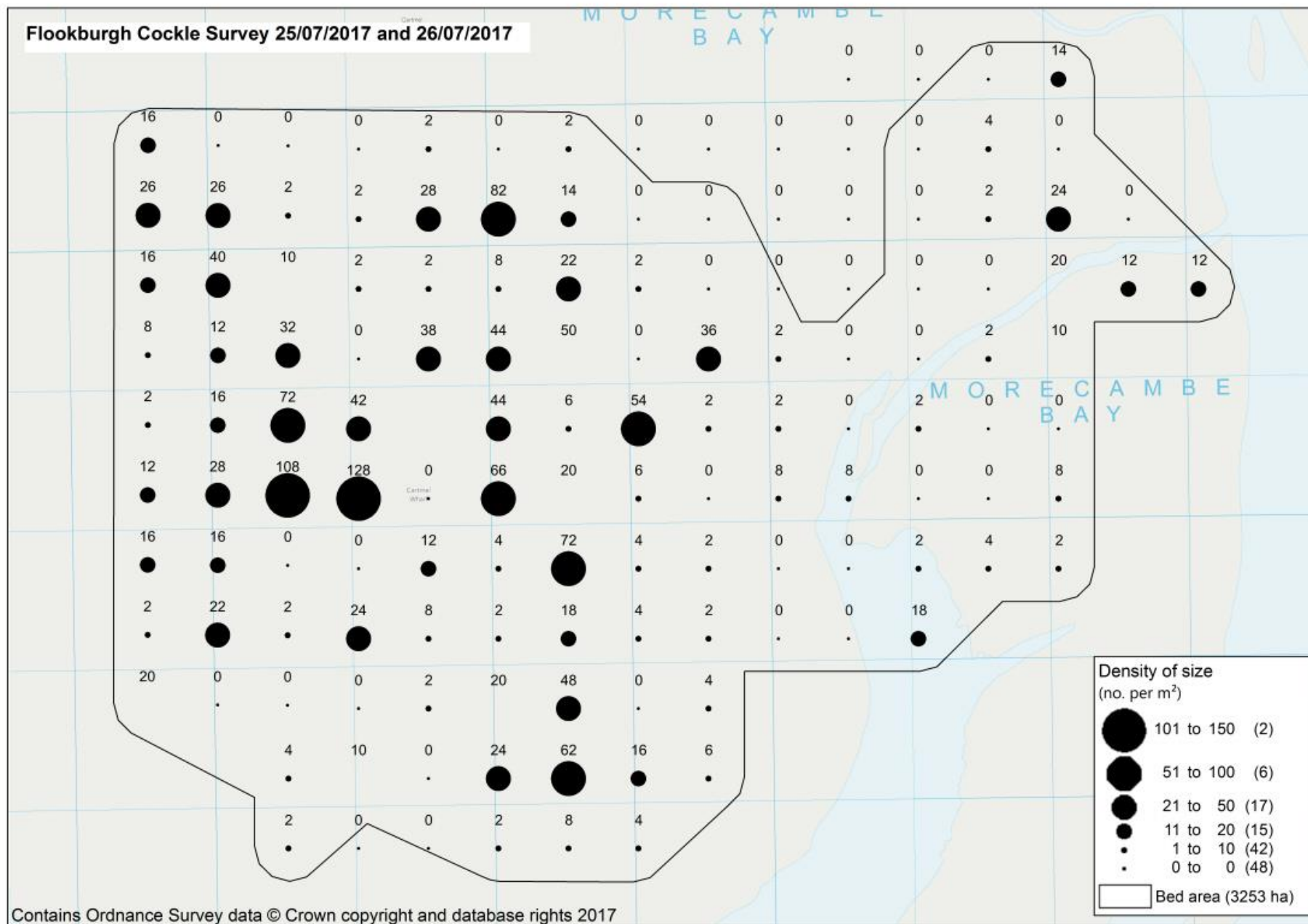
Mean number of size cockle = 14 per m² (min. 0, max 128)

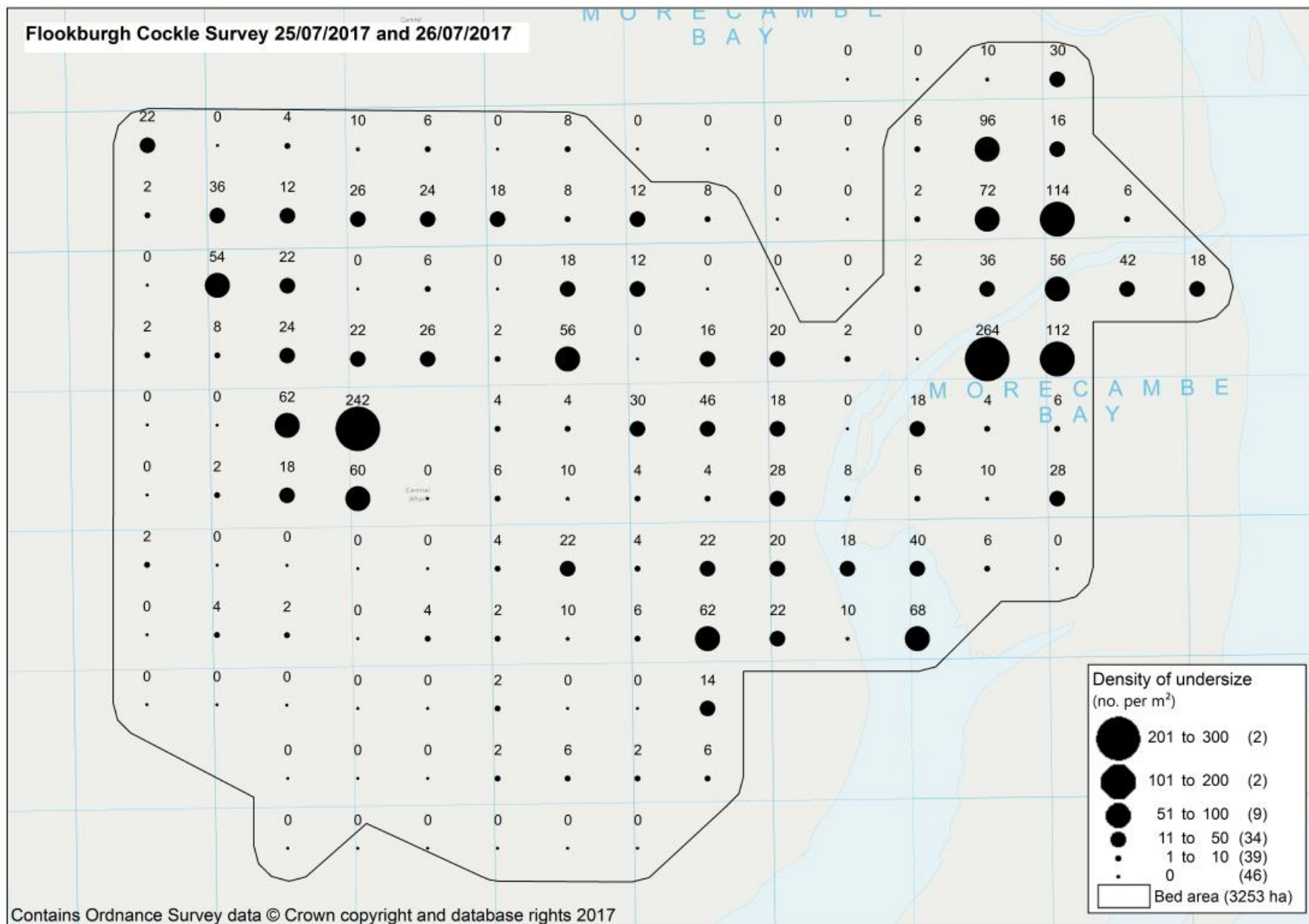
Mean number of undersize cockle = 19 per m² (min. 0, max 264)

Total bed area = 3253 ha









Leven Sands Survey 20/08/2017

Survey method – Jumbo and 0.5m² quadrat. 18 survey stations were sampled in total from a grid with stations 500m apart with 14 extra stations added to get full coverage of the area of cockle.

Means were calculated from all survey stations within the defined bed area (zero counts on the edge of the bed have been removed).

Mean number of size cockle: 28 per m² (min. 0, max 120)

Mean number of undersize cockle: 20 per m² (min 0, max 88)

Biomass

	Area (ha)	Size Cockle (tonnes) ¹	Undersize Cockle (tonnes)
Leven	814	2202	215²

¹In regards to biomass size cockle defined as cockle ≥ 27 mm shell length.

²The biomass of undersize cockle does not include any estimates of cockle less than 10mm in shell length although there are small numbers of this size class on the bed.

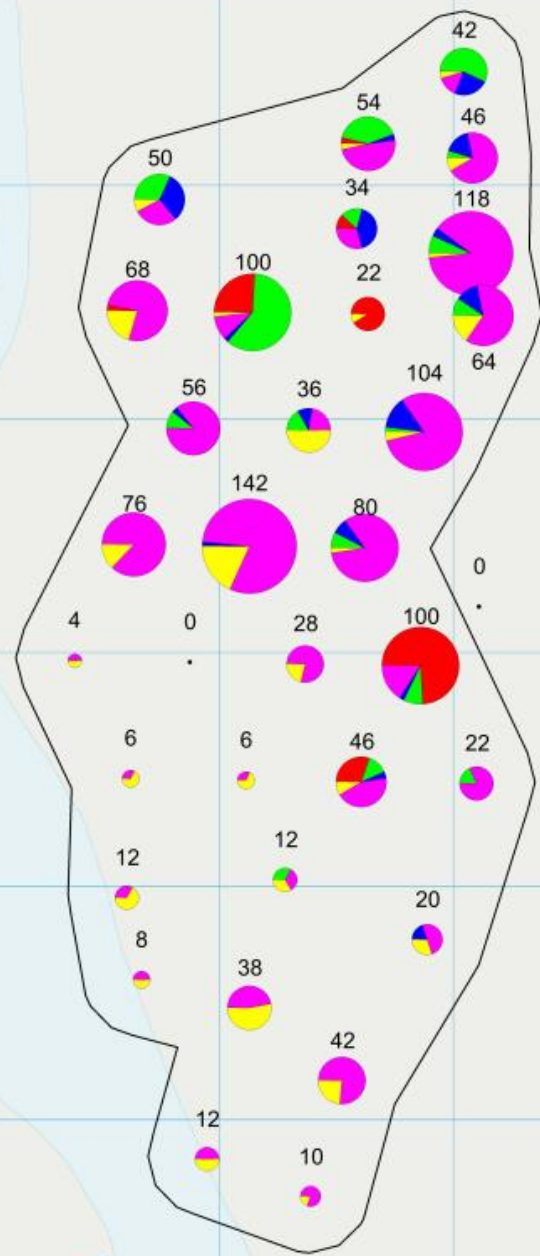


Leven Cockle Survey 20th August 2017

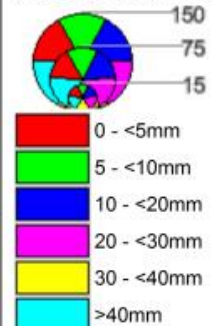
verston
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Wharf

Cartmel
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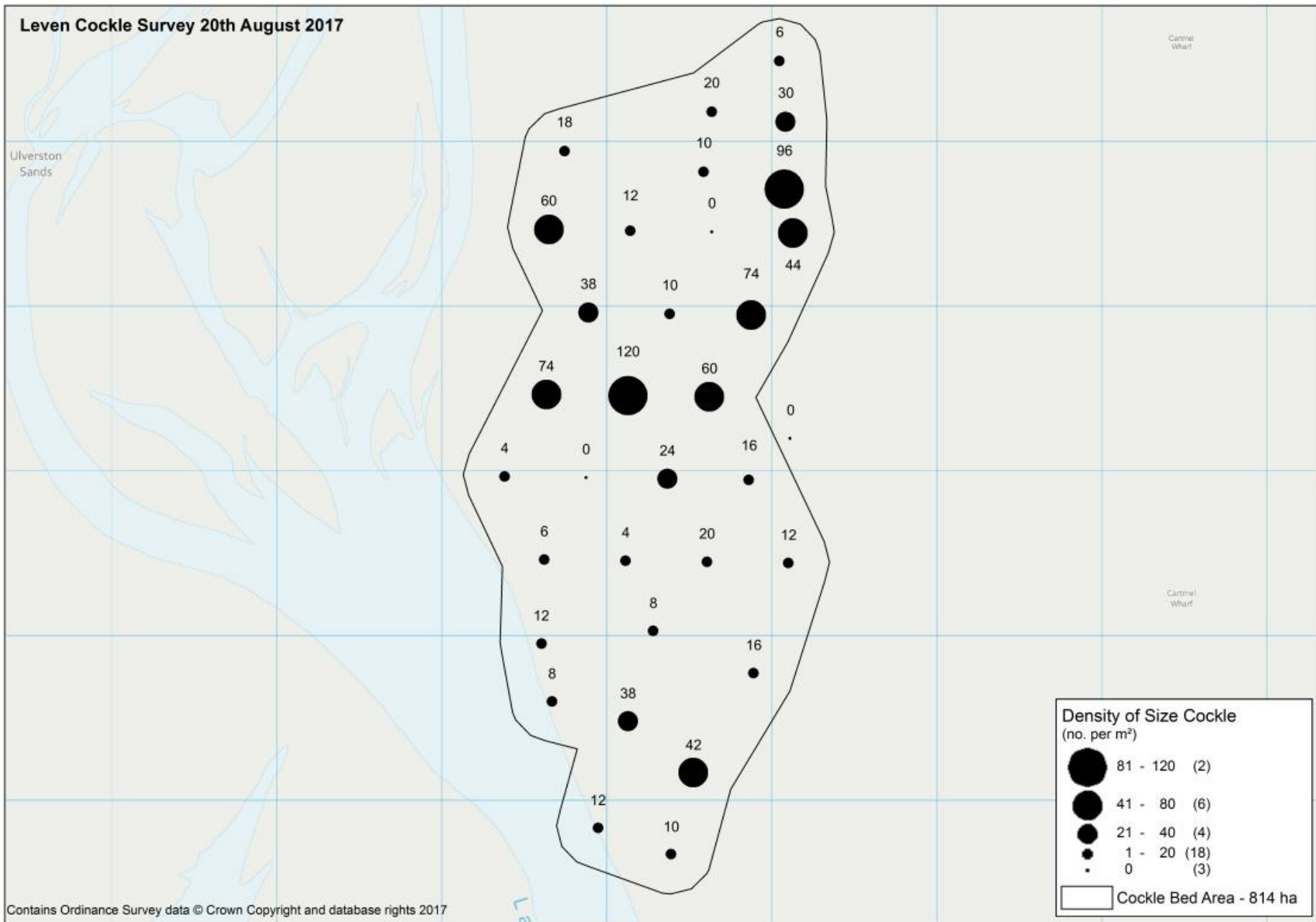


Frequency of size classes
(size of pie indicates density m²)



Cockle Bed Area - 814 ha

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Warton Sands Survey 9th August 2017

45 survey stations we sampled using a jumbo and 0.5m² quadrat. A total of 11 size cockles were found across the whole survey area. 24 of the 45 stations had zero cockles. Undersize cockle density ranged from 1 to 32 per m². Size cockle density ranged from 4 to 6 per m².

No mapping or data entry has been done for this survey due to the lack of stock present on the bed.

Pilling Survey 13-07-2017 / 10-08-2017

Survey method – Jumbo and 0.5m² quadrat. 49 survey stations were sampled from a grid 500m apart with two extra points added beyond the grid to ensure the full extent of the bed is covered. To the east of the bed there is a large area of undersize cockle very little size cockle mixed in with it. The middle of the bed contains the majority of the size cockle.

Means were calculated from all survey stations with the defined bed area (zero counts on the edge of the bed have been removed).

Mean number of size cockle: 22 per m² (min. 0, max 92)

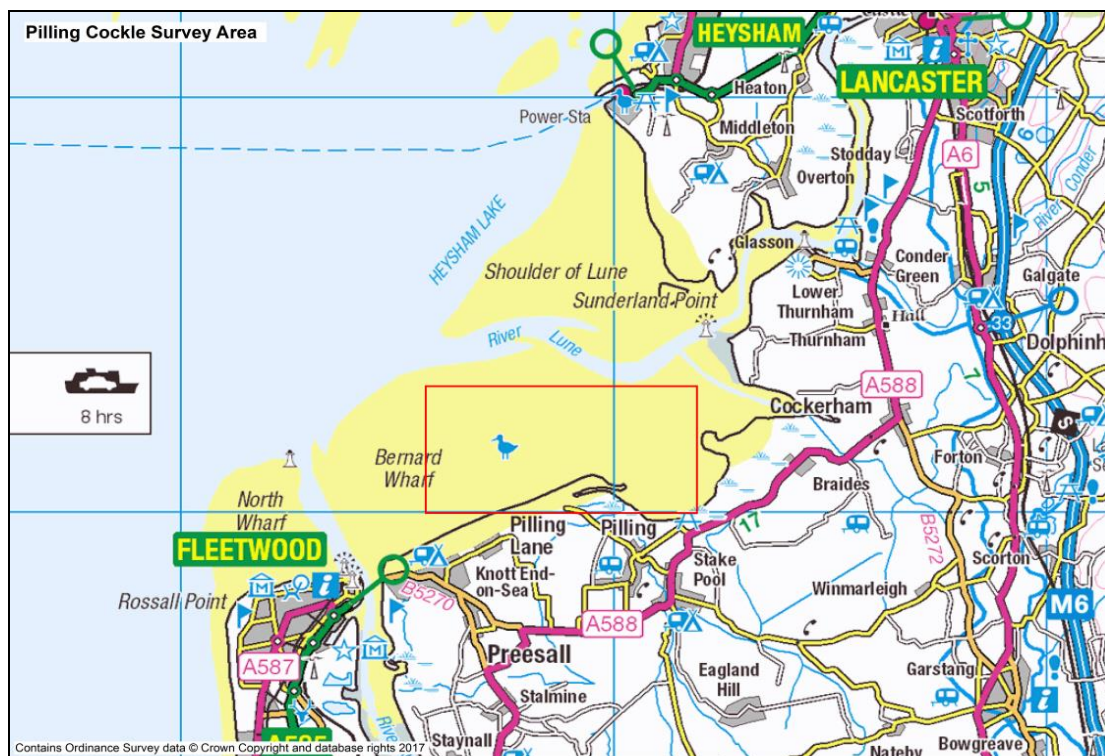
Mean number of undersize cockle: 37 per m² (min 0, max 624)

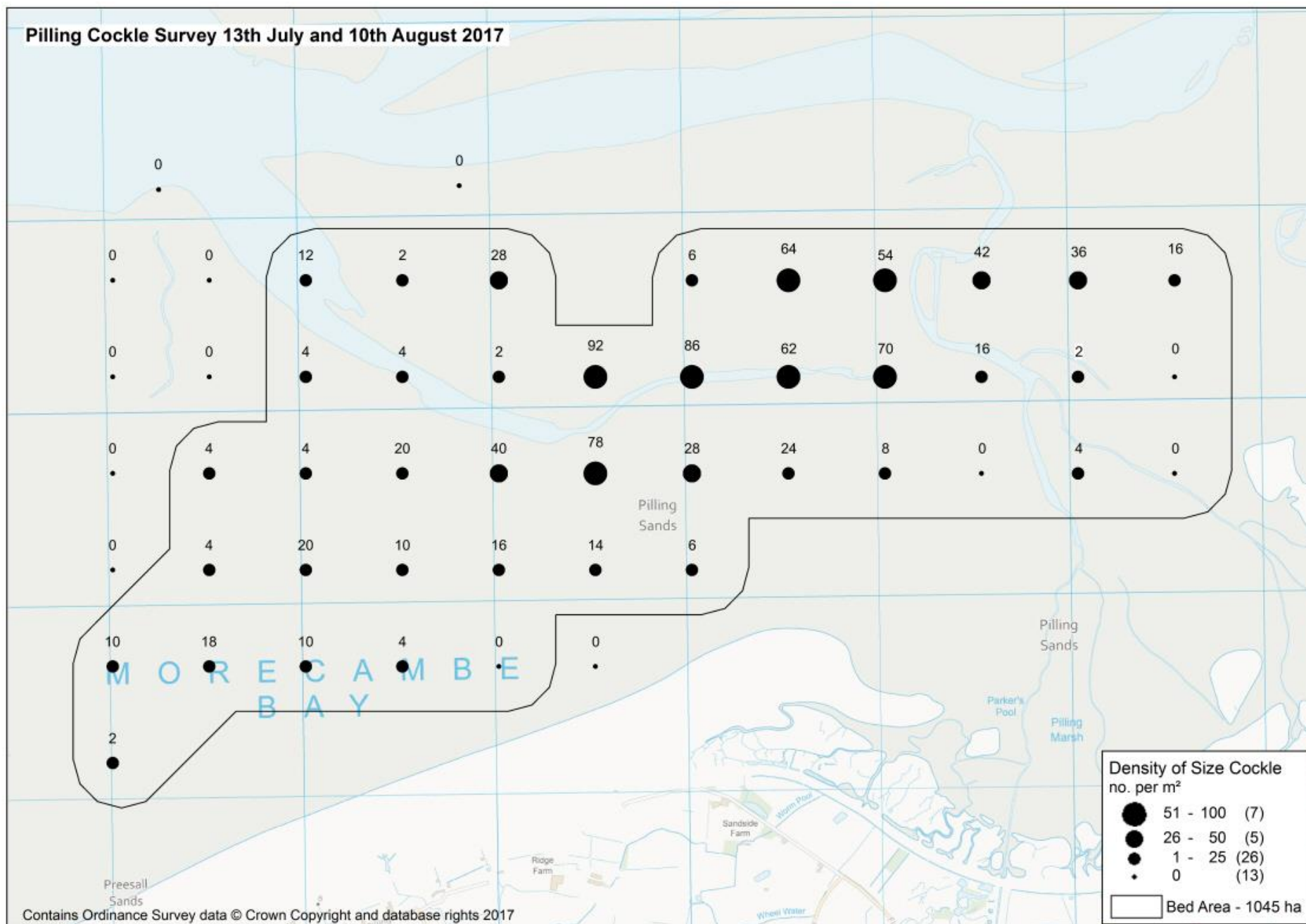
Biomass

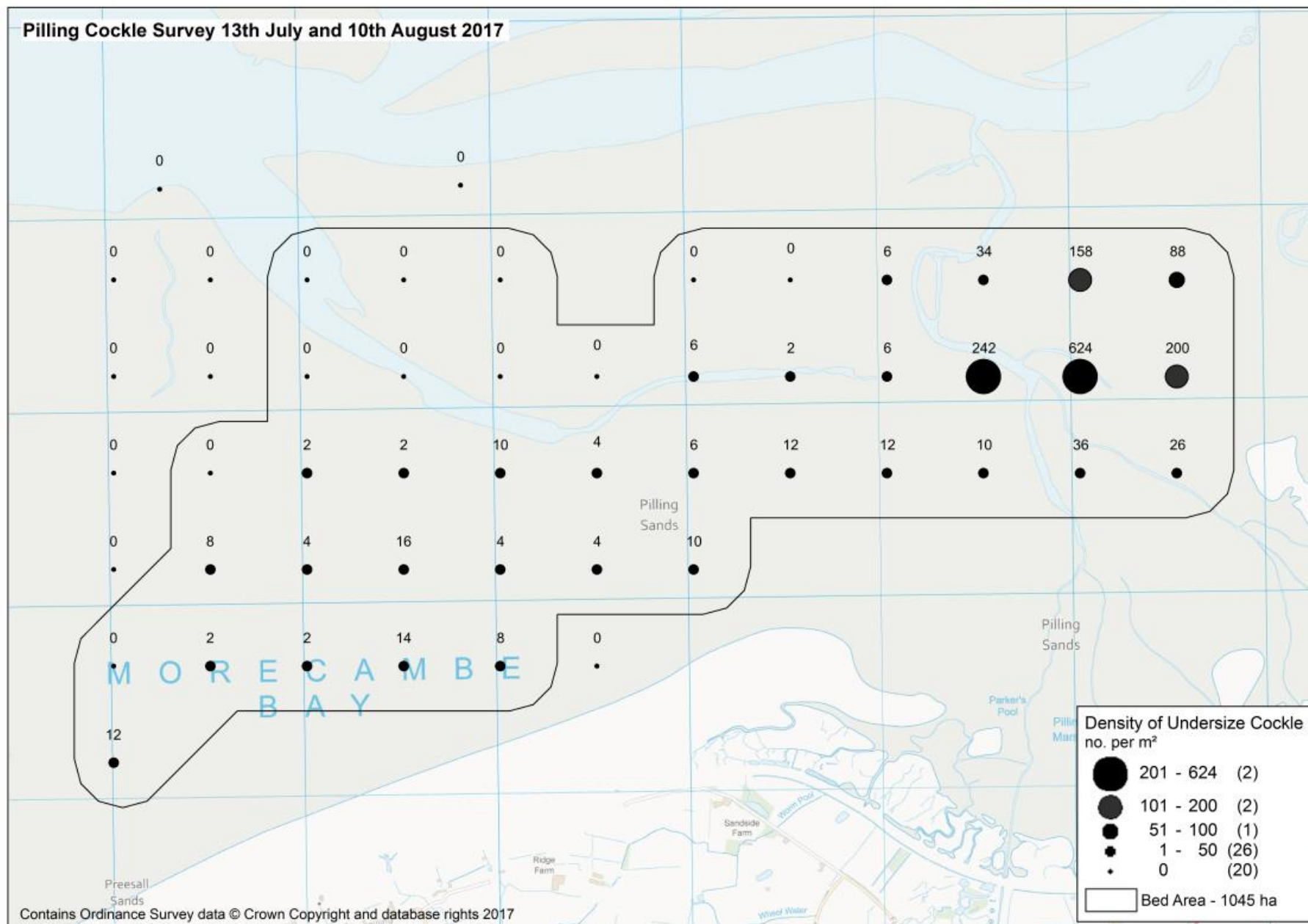
	Area (ha)	Size Cockle (tonnes) ¹	Undersize Cockle (tonnes)
Pilling	1045	571	3250²

¹In regards to biomass size cockle defined as cockle ≥ 27mm shell length.

²The biomass of undersize cockle does not include any estimates of cockle less than 10mm in shell length although there are small numbers of this size class on the bed.







Cockles – Ribble Estuary

Penfold North Survey 27/07/2017

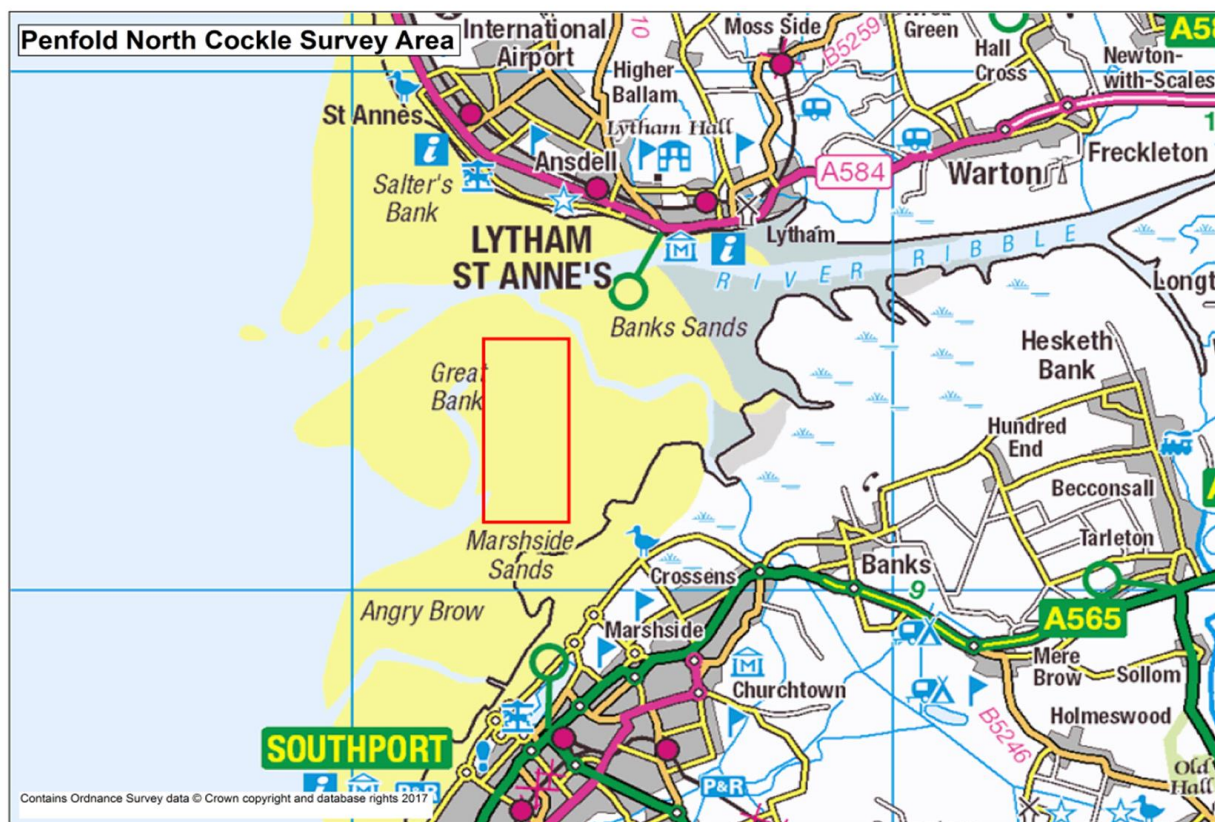
Survey method: 0.1m² quadrat and sieve. Due to the extremely muddy nature of the ground on this bed it is not accessible by quad bike and difficult to get to on foot. The bed was tracked around and survey stations were sampled at random. As previously reported the bed contains a dense patch of cockles greater than 20 mm, this appears to have spread further than the area reported from the last survey undertaken in March. Within this patch there were also high numbers of spat (0-5 mm size range). Outside of this dense patch the majority of cockles were in the 5-10 mm size class. In total 10 stations were sampled.

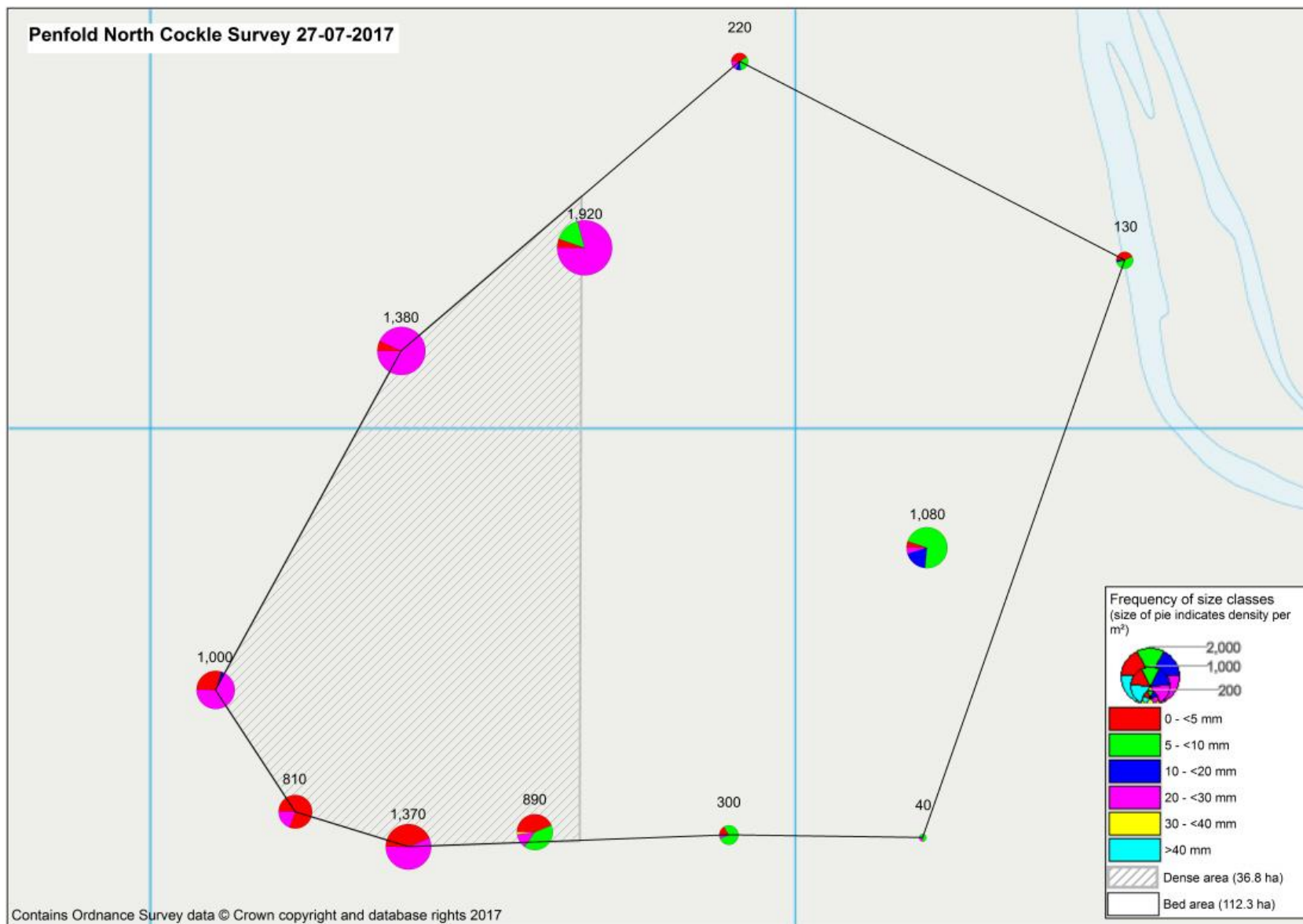
Mean number of size cockle = 71 per m² (min. 0, max 290)

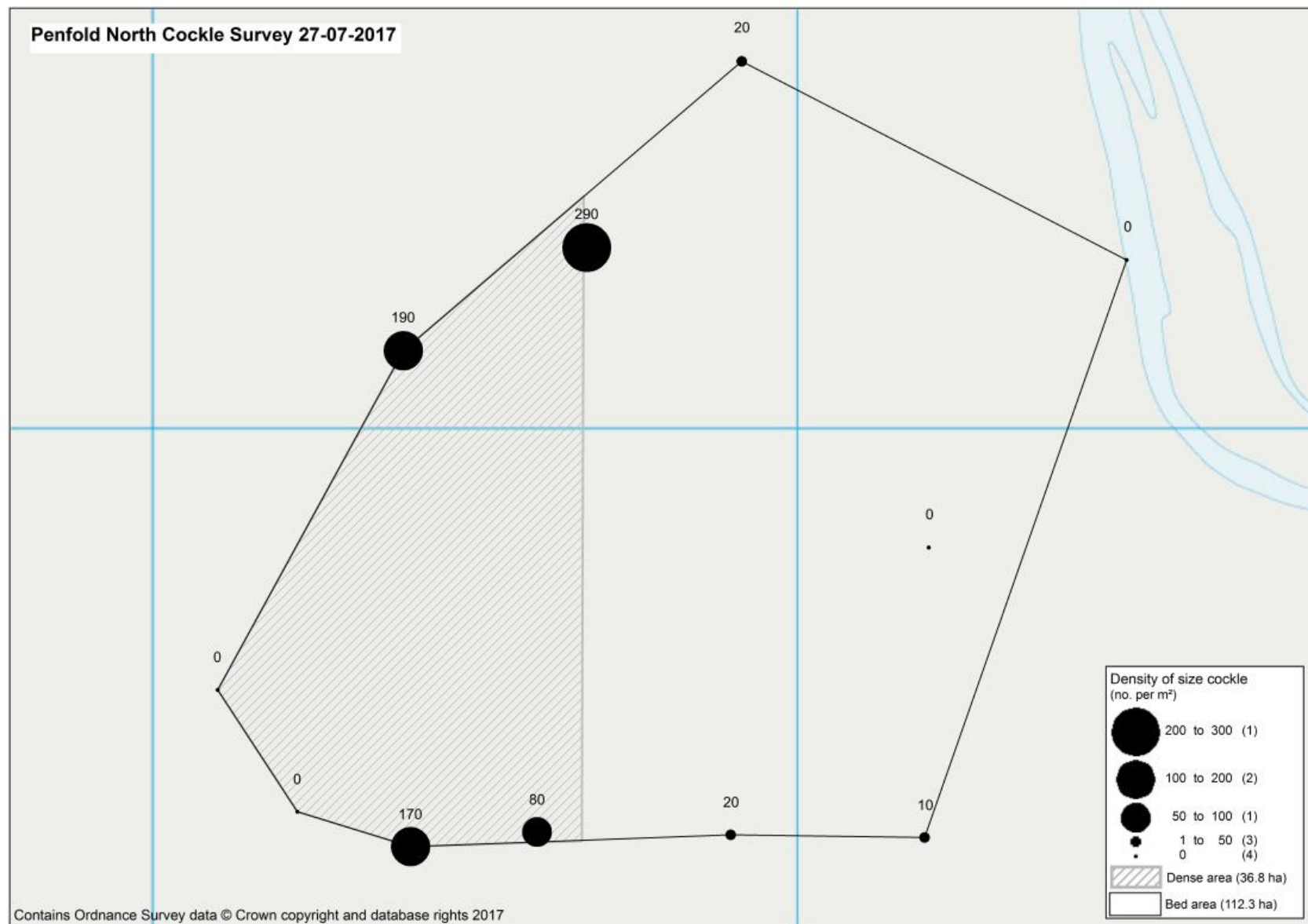
Mean number of undersize cockle = 760 per m² (min. 30, max 1630)

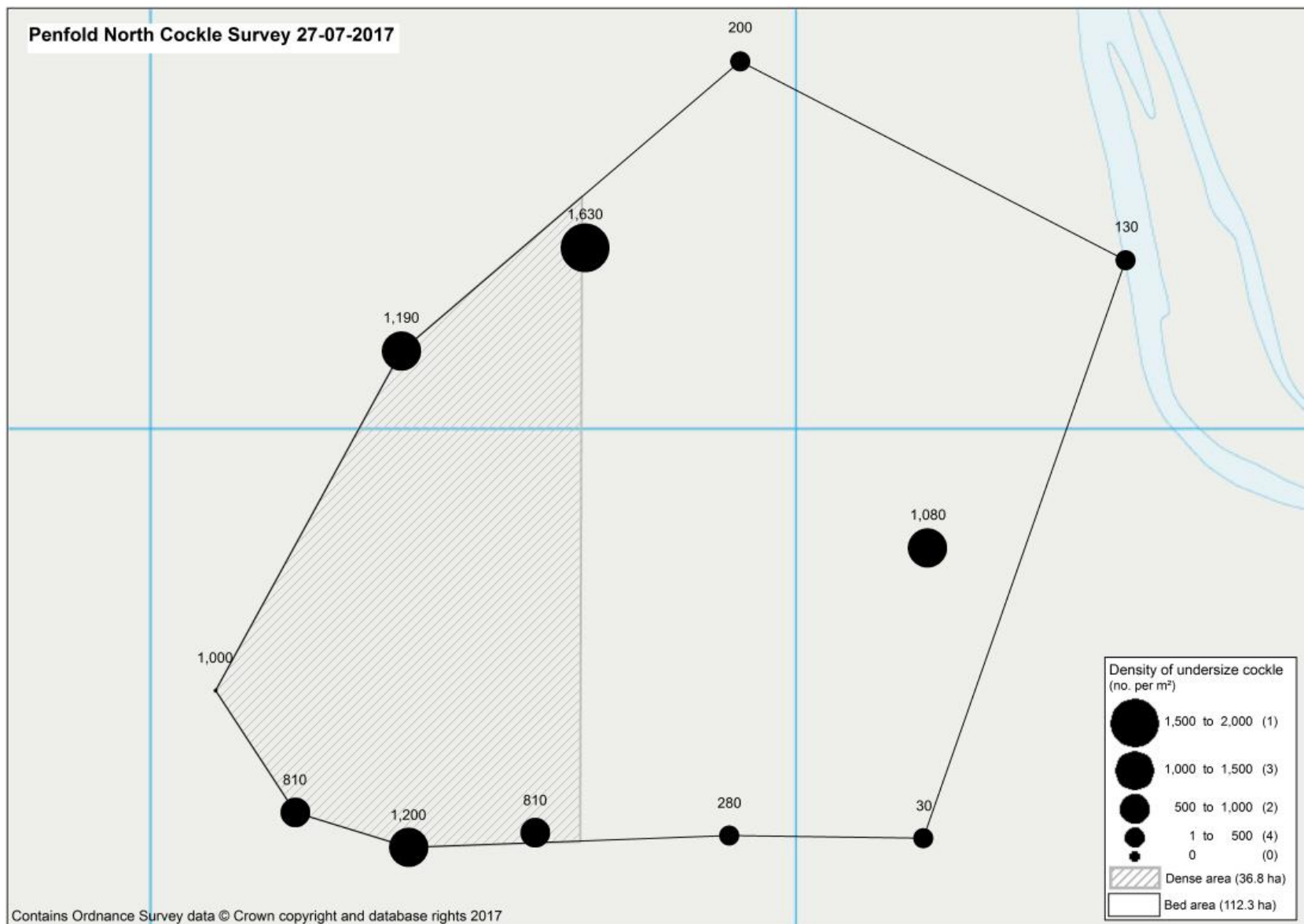
Total Bed Area = 112.3 ha

Area of dense patch = 36.8 ha









Mussels – Dee Estuary

Thurstaston Inspection 07-09-2017

Walked out from Dee sailing club slipway to the mussel bed. Ground was muddy and claggy. Ground around the mussels and on the beds themselves was too muddy to walk on so waypoints were taken at start and end of tracks on the outer edges of three beds. The inner edges of the beds were not tracked but mapped up from Officer's estimations. Percentage cover of mussel on the ground was estimated and recorded from rapid visual assessment.

There was another bed southeast of the slipway which we did not get to.

First bed – $0.063 \text{ km}^2 = 6.3 \text{ ha}$ - some size mussel, but majority 35-40mm. Coverage = 75-80%

Second bed – $0.074 \text{ km}^2 = 7.4 \text{ ha}$ - there is an inner narrow channel – the mussel around the edges of this was

larger and some again reaching size. Otherwise again 35-40mm, with estimated 60% cover.

Third bed – $0.03 \text{ km}^2 = 3 \text{ ha}$ - was much more patchy but held some good mussel. Not yet size 35-40mm, coverage = 50%.

There was cockle both live and shell all around – this mussel is on cockle ground. It has settled on dying cockles and cockle shell. The areas in between the mussel beds are being fished by Dee Cockle Licence holders. There are masses of cockle that are dying off – they have barnacles on the shell near the hinge preventing the cockle from closing.

There was also mussel in the mud – so possibly more than visible. They were still live. This settlement was from 2016 – so slow growing but sticking through to size.

West Kirby Mussel Inspection 07-09-2017

Officers walked out from West Kirby sailing club slipway to the mussel bed. Ground was muddy and claggy. Due to the muddy condition of the ground it was not possible to track around the edge of the bed. Officers walked to the middle of the bed and estimated the distance to the edge of the bed.

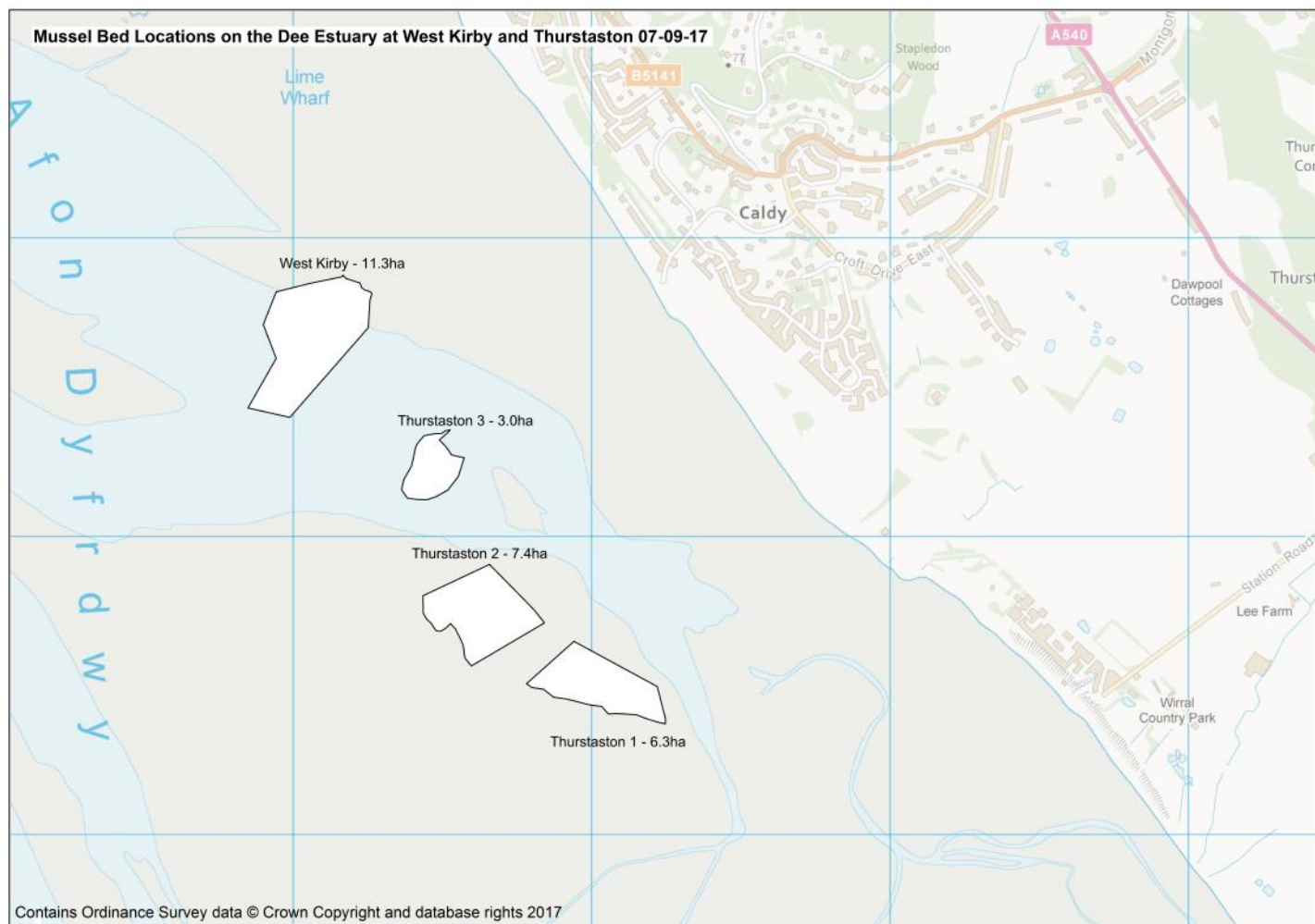
Just before reaching the mussel bed there were patches of dead cockle shell mixed in with some live cockle which increased nearer to the bed. The bed itself was patchy around the edges at around 10-20% coverage. The percentage cover increased up to around 40% near the middle of the bed. The bed comprised dense patches of mussel, some in strips others in wider patches. In between were stretches of thick mud.

There was a mix of what was found on the bed ranging from:

- Cockle. Dead shell and some live patches of cockle.
- Near shore edge of mussel bed. Patchy with dead shell. Some mature and small mature mussel here. Mature mussel was just size. Much of the mussel was barnacled.
- Size mussel mixed with dead shell. Strip of mussel on the edge with a large muddy patch to the west before reaching the middle of the bed. 10% coverage. Some barnacled.
- An area of 20-30% coverage some stunted and barnacle ~30 mm with some just reached size. Dead cockle and mussel shell mixed in.
- Point in middle of bed held larger mussel ~ 40-45 mm. Some barnacled. Mixed in with newer mussel – not yet barnacled and ~25-30 mm
- A muddy bare patch 2-5% coverage
- Point in middle of bed. 40% coverage barnacled mixed in with small mature. Mussel here 30-45 mm
- Small mature barnacled mussel 10-30%. Newer spat mixed in here

Overall % coverage – max = 30-40%, average = 10-20%

As a biosecurity measure seventy small crabs were collected from the mussel samples taken from West Kirby and Thurstaston and identified for the presence of Chinese mitten crab. All crabs were identified as shore crabs.



Mussel bed locations and estimates of area on the Dee Estuary.

Mussels – Morecambe Bay

Heysham Flat

Heysham Flat Mussel Inspection 21-09-2017 (0.8 m tide)

Walked as far as Dallam Dyke: the mussel here was patchy but there were dense patches hard in to the ground. The majority of mussel here was undersize; however there was some size mussel present (1). Size ranged from 25-50 mm. There were patches of dead *Sabellaria alveolata* present; the tubes had sanded over (2).

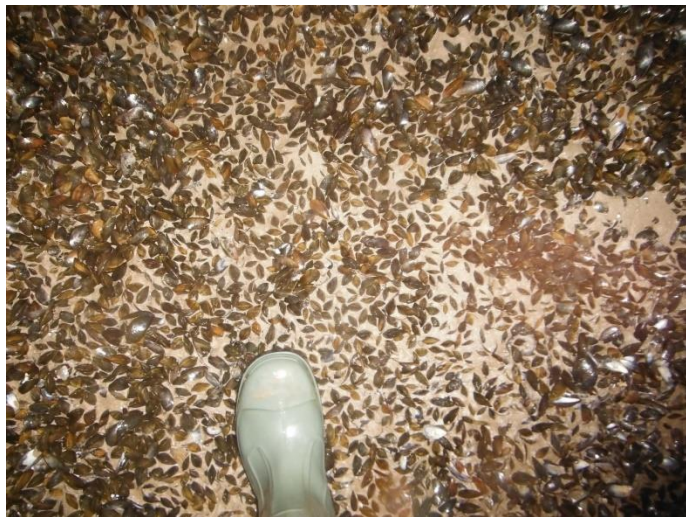
Looking across to Knott End skear it could be seen that it had extended into the channel creating a narrower crossing on the north side (3). There were also islands which looked like they had settlements of mussel on them to the north of both Knott End skear and the main skear.

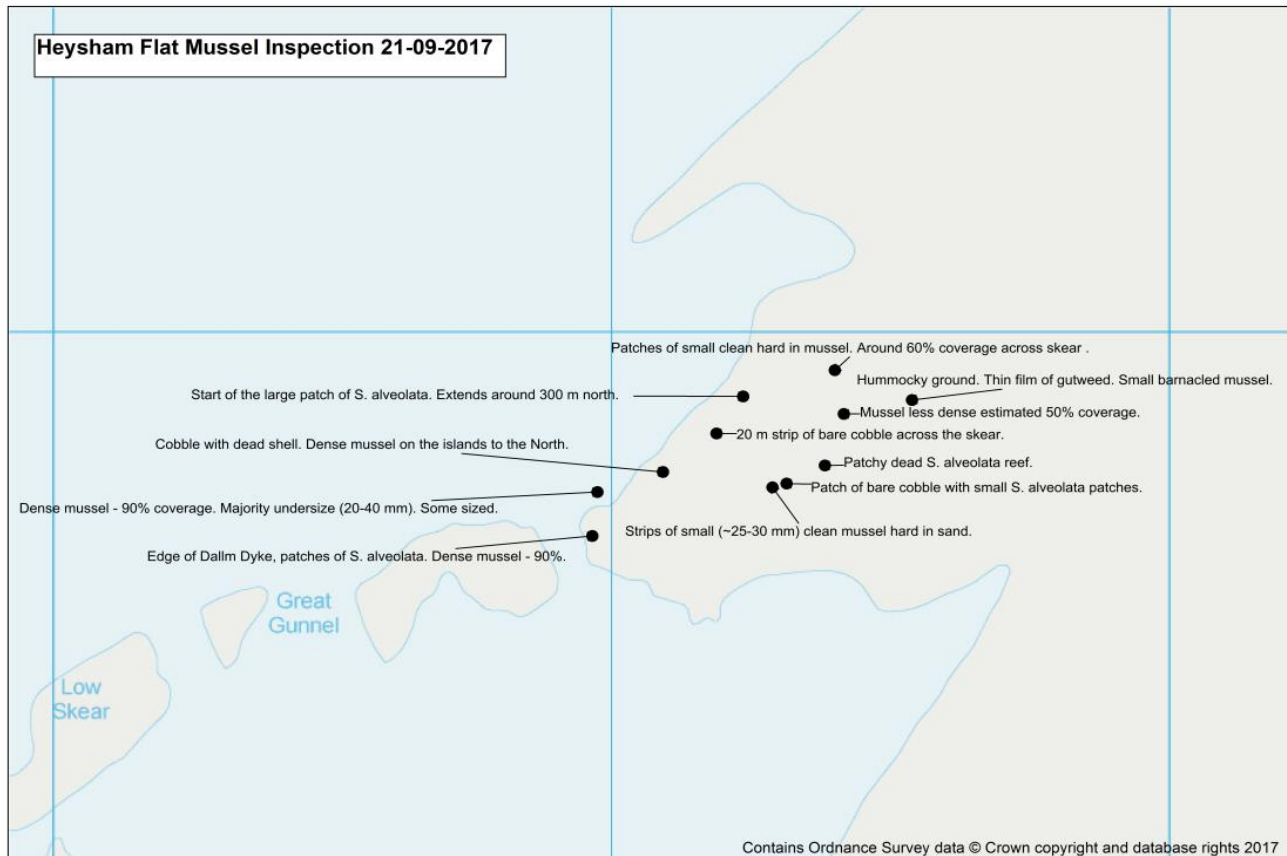
Earlier in the year mussel had covered the main skear from Big Stone to Dallam Dyke; now some of this had washed out leaving patches of bare cobble and stone with scattered dead shell. There was still mussel present ranging from 20-80% cover between Dallam Dyke and Big Stone (4). A lot of the main skear looked like it had sanded over. The size of the mussel got smaller from Dallam Dyke towards the shore ranging from 20-40 mm. Mussel was hard in the ground with only one layer of mussel present in the sandy mud (5). From Big Stone towards the shore mussel became less dense and the ground more hummocky. A thin film of gutweed was present from here across the skear towards the shore (6).

Patches of dead *S. alveolata* were found across the skear – not just on the edges as seen on previous inspections. The ground was hard and sandy underfoot with little mud present.

A large, healthy, live patch of *S. alveolata* extended across the northern edge of the main skear (7). This has not previously been seen this year. The side closest to the skear was tracked and it extended about 300m north of this track. Sand mason worms could also be seen on the sandy ground amongst the *S. alveolata* reef.

Gulls, terns and oystercatcher (200+) were present across the main skear and the outer skear with many on the islands north of the skears.





South America and Falklands – Mussel - Quad Inspection– 22 -08-17

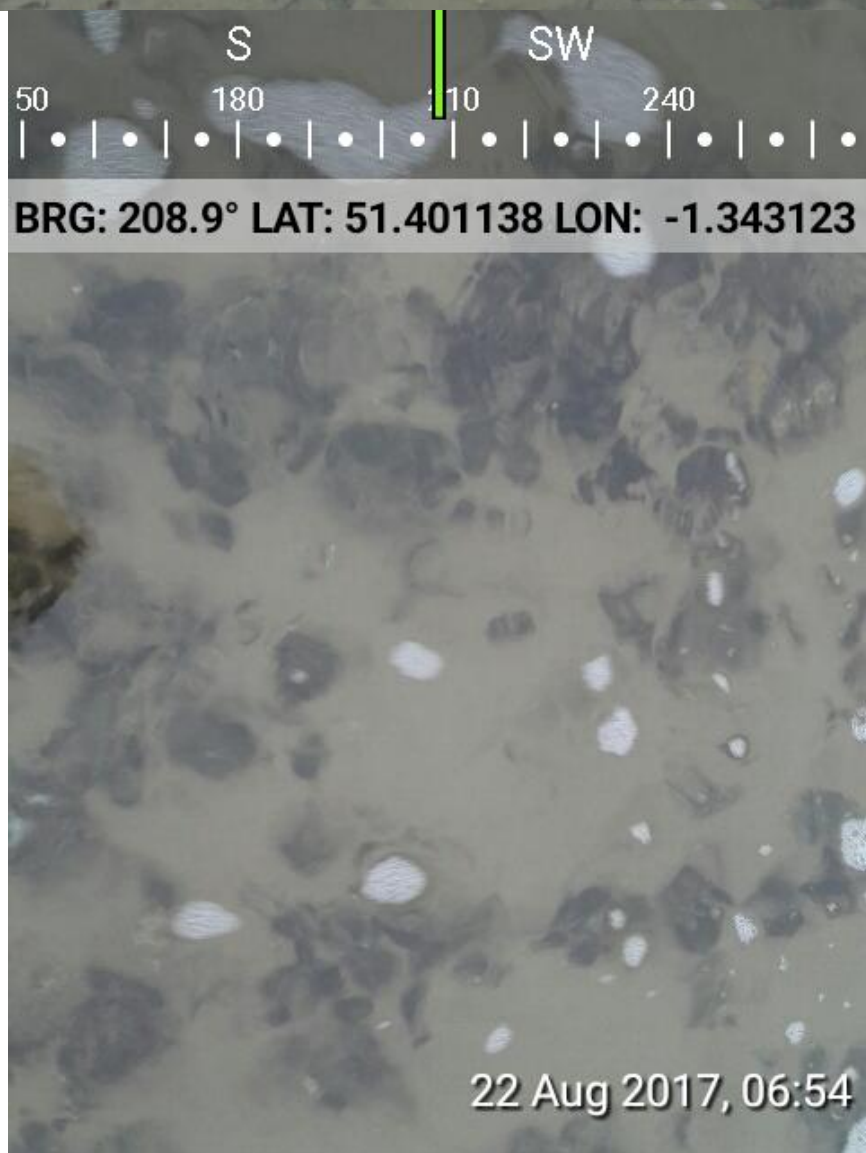
A Byelaw 3 permit holder had supplied officers with positional and photographic evidence of seed mussel on a circular patch on South America in Morecambe Bay. This was mapped against the July heliflight tracking when this area had been seen from the air by Officers and photographs taken.

Officers accessed the bed by quad bike on a 0.7m tide on 22nd August. The seed had looked consistent across the bed which covered around 3ha in July. It is now down to around 30% cover, with seed looking healthy at around 25mm shell length, mainly sitting on sand of around 10cm depth. There is evidence that some of it has scoured out. Where the seed is sitting on mud the mud is around 30 cm deep. There are cobbles and stone around between the mussel. The mussel remaining appears very loose, not embysed and likely to also wash out. There were small clumps of *Sabellaria alveolata* around the eastern edge of the bed, the first time it has been seen in the north of the Bay.

Officers considered that the bed was not suited to fishing by dredge. If there was interest from hand-gatherers it could be considered for a low level of hand-gathering with no perceived risk to any conservation features.

Photos georeferenced with 'Solocator' app on Android smartphone.





Heliflight Inspection of Morecambe Bay – 23-08-17

A heliflight commissioned by industry was undertaken on 23rd August on 0.6m tide. NWIFCA Senior Scientist and Mark Johnston from Natural England attended.

South America and Falklands:

The flight confirmed what had been seen on foot on South America that there was not sufficient stock and the condition of the stock and ground was not suitable for a dredge fishery. There was some seed mussel still in evidence at Falklands but it is not putting down mud, and there are cobbles and stone laying bare on the skear. Again this area was not suitable for a dredge fishery.

Bottom skears at Heysham:

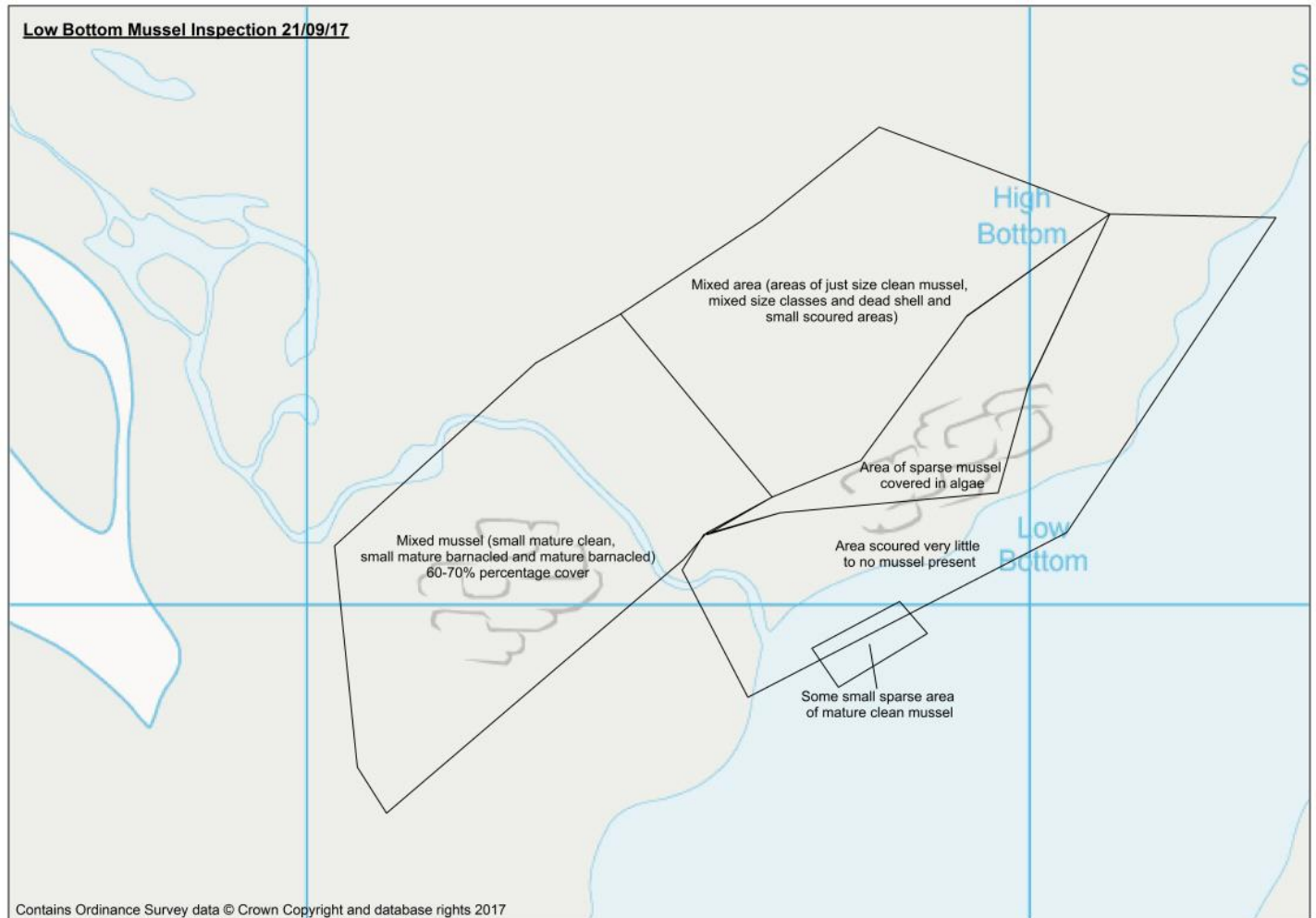
Some of the seed had washed out and an area of the skear is partially now sanded over. The seed had still not put down mud and there were boulders evident. The stock was not suitable as a dredge fishery.





Low Bottom Mussel Inspection 21-09-17

Inspection Method: Notes and GPS positions taken of notable areas and areas of interest. The type of mussel found at each location was recorded. A walk over inspection was completed and rough polygons mapped (see below) recording the areas of change in mussel types. Overall from a bird food requirement view there is a lot of mussel of varying size across the area surveyed. The mussel across the bed is very mixed with the majority of areas containing live mussel with dead shell. At the bottom of the Ditch / low water line there are areas which have been scoured out leaving bare substrate. At low water there were a few small patches of size mussel but in very low densities. The area which was covered in algae appears to have reduced in size. Higher up the shore there are areas with clean mussel that is just below minimum landing size.



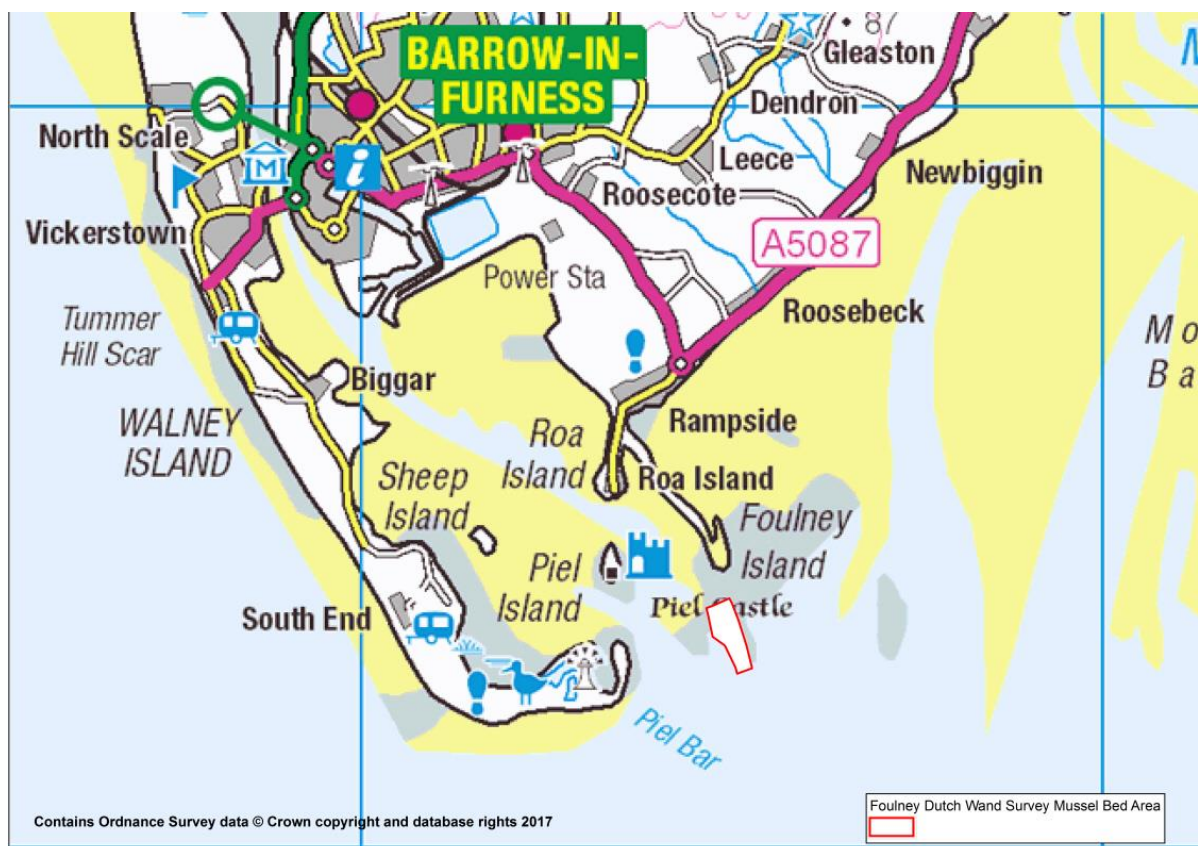
Survey Method - Dutch Wand. Line transects were completed using a Dutch Wand. The number of hits and misses of live mussel were recorded to give percentage cover. The transects start and finish at the edge of the mussel bed. It was not possible to cover as much of the bed during the present survey as has been covered previously due to time and officer constraints. On 25/5/17 a total of 59.12 ha was covered during the survey which included an additional area of mussel bed to the west that has not been included in the present survey.

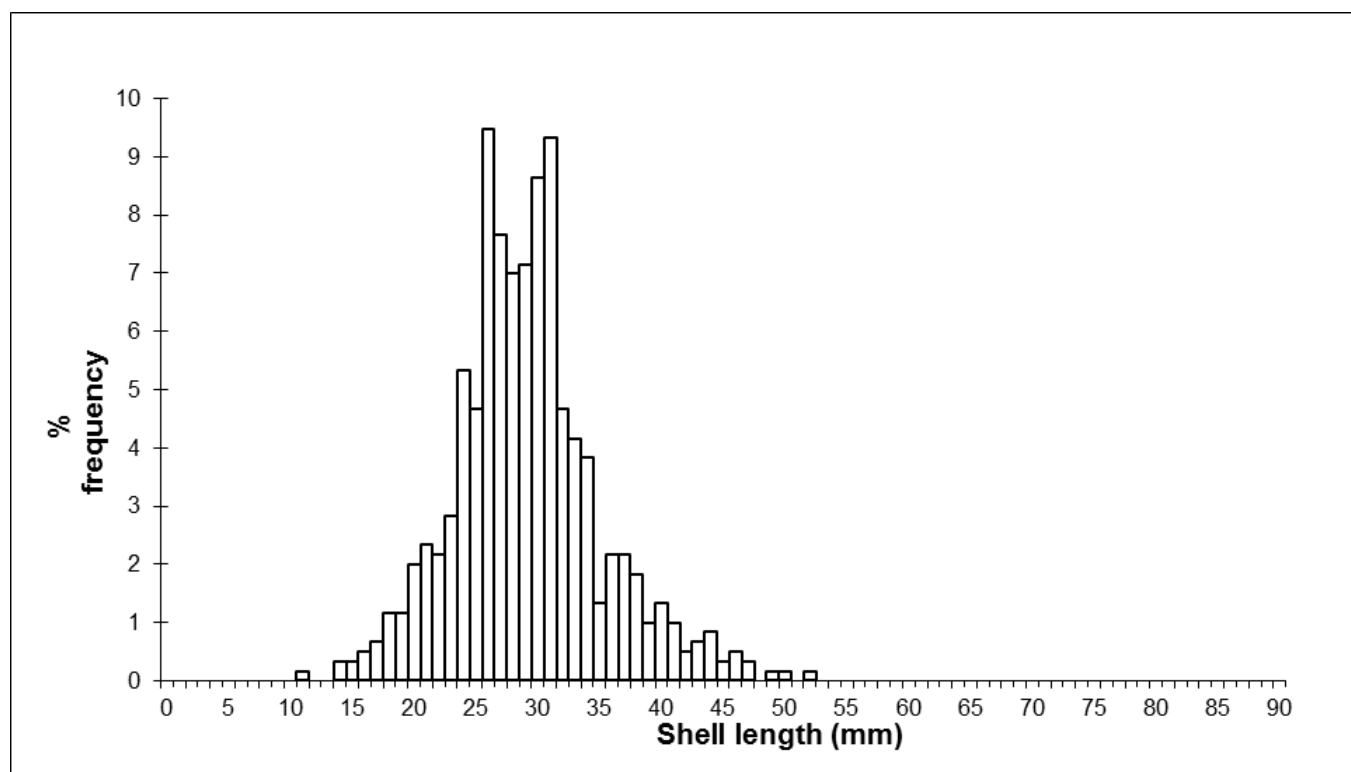
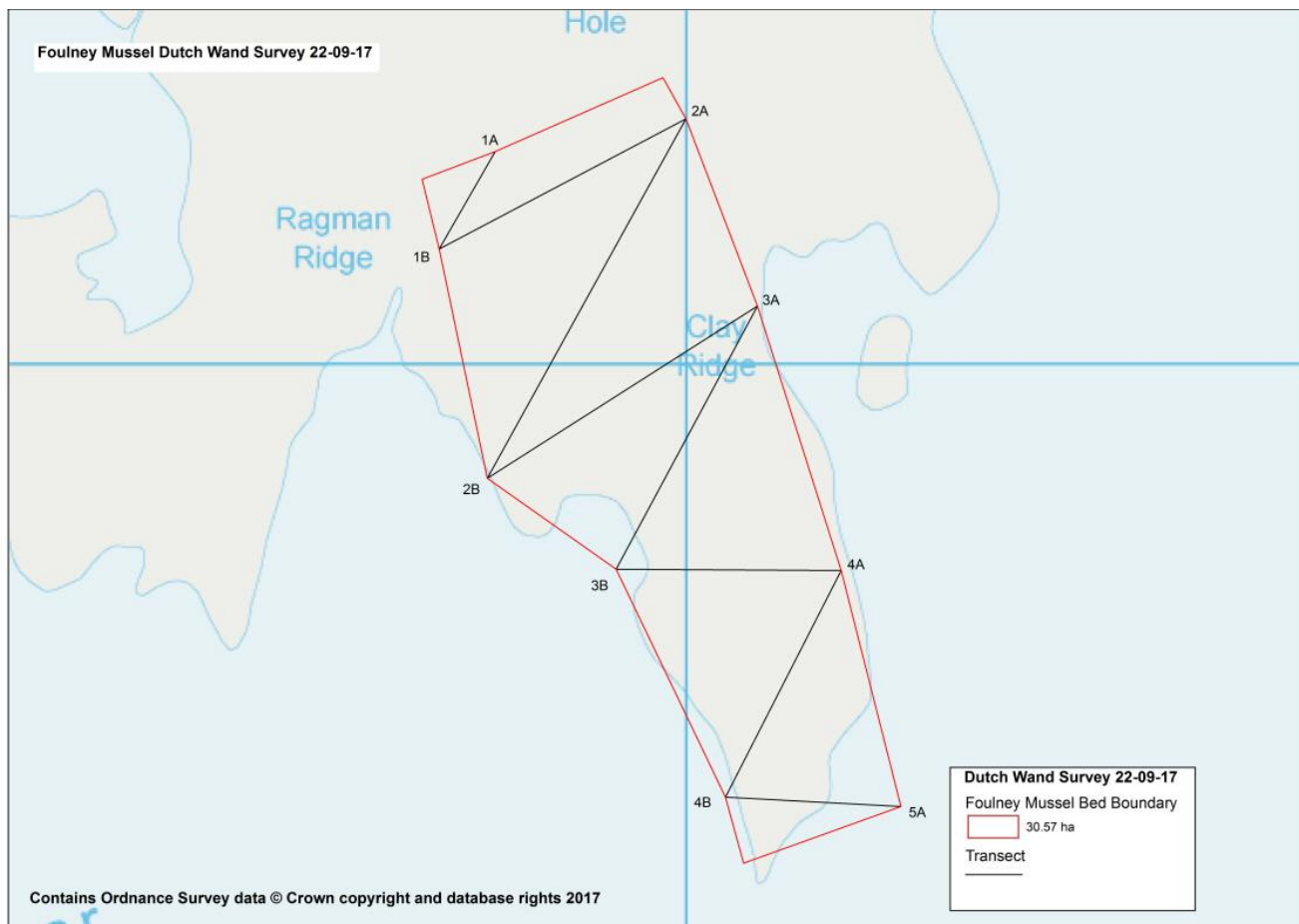
A mussel sample was taken every 50 hits using a 10 cm diameter corer. Eight transects were completed and 18 samples collected. Total weight of live mussel and the size frequency was recorded. A sub-sample of 50 individual mussels was measured from each sample.

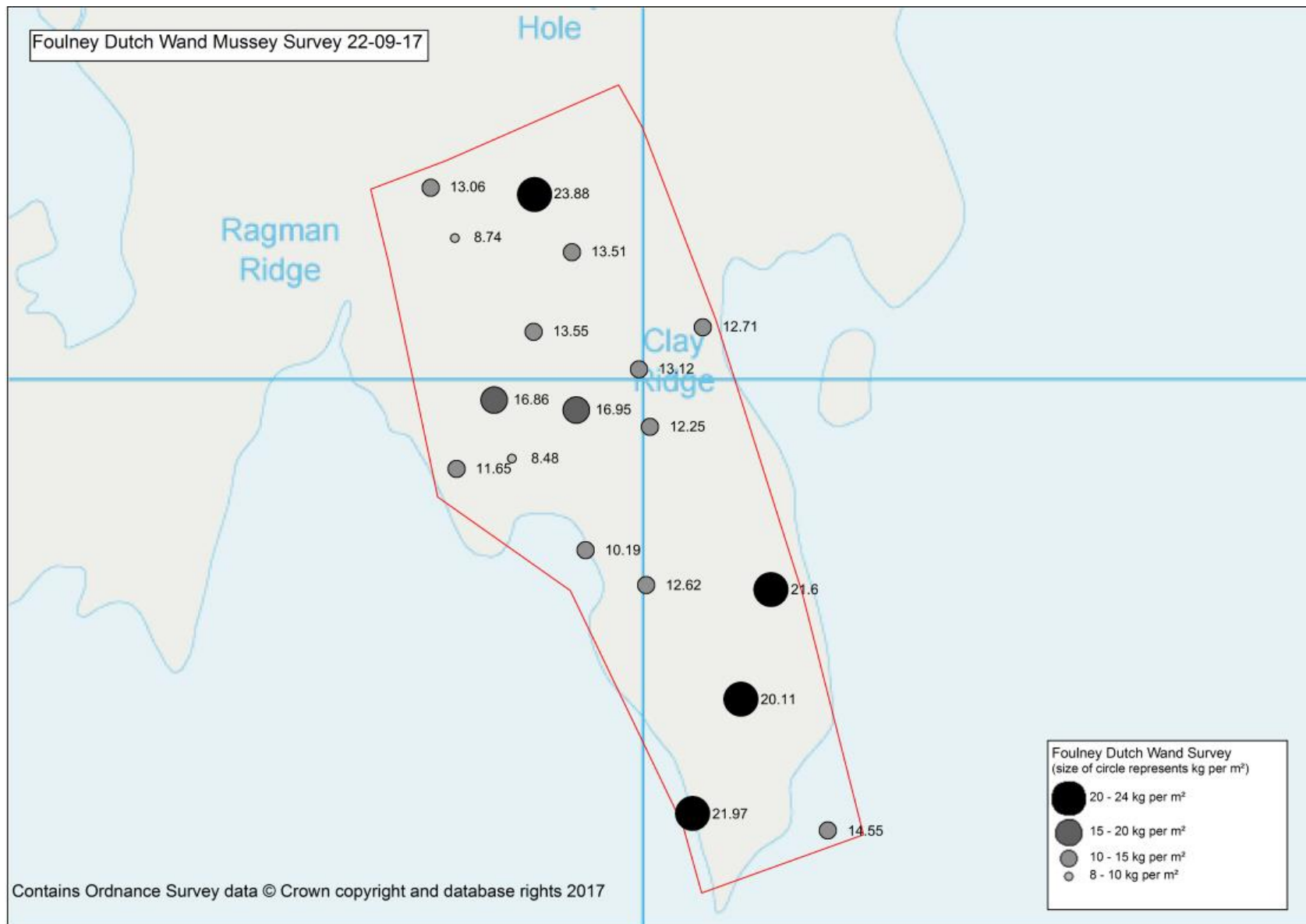
From the transect and sample data, it is estimated that in the bed area highlighted in the map was 30.57 ha, and in total there was 3331 tonnes of mussel of which 217 tonnes is size mussel. The total length frequency for the bed is provided in the histogram below. The highest frequency of mussel was found in the 26 -32 mm size range.

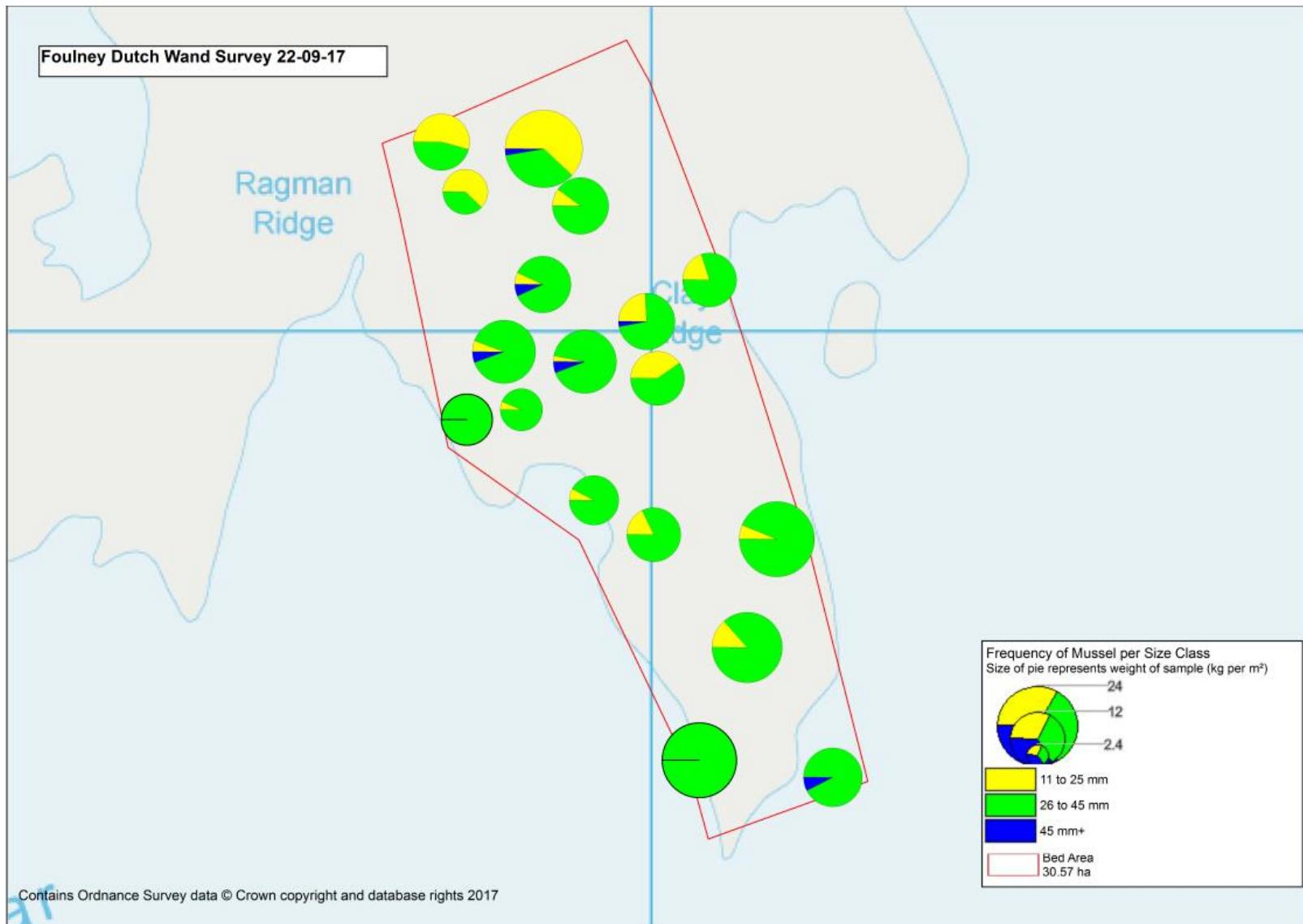
The weight of each sample has been standardised and is represented as kg of mussel per m². This is shown in the maps below. The biomass of mussel varies across the bed and increases towards the southern end of the bed.

The frequency of each size class of mussels per sample has been standardised per m² and represented using pie charts in the map below. The size of the pie chart is proportional to the total number of mussels per m². It can be seen on the map that the most abundant size class is the 26-45 mm which makes up the majority of the samples.









Mandy Knott
Senior Scientist
20th October 2017