
# The Study of The Wash Embayment Environment and Productivity

## Summary Report (2017)

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**Elise S. Quinn**

# 1.0 Introduction, materials and methods

## 1.1 Introduction

The Study of The Wash Embayment Environment and Productivity (SWEEP) began in 2009 in response to observed declines in the bivalve biomass of The Wash Embayment (Figure 1), including declines in ecologically and commercially important cockle (*Cerastoderma edule* L.) and mussel (*Mytilus edulis* L.) stocks (Jessop *et al*., 2009). The Wash cockle and mussel fisheries are important to the local economy and any threat to the fishery would have strong local economic and social implications. Furthermore, cockles and mussels dominate many of the communities of The Wash, providing an important food source for protected bird species in The Wash and North Norfolk Coast Special Area of Conservation. Although yearly variation in cockle stock biomass is normal due to natural processes resulting from environmental factors (e.g. “ridging out”), the 2008/2009 declines in biomass were deemed atypical. Five thousand tonnes of cockles were lost from the Wrangle bed alone in 2008 (Jessop *et al*. 2009). In line with this decline in cockle stocks, a decline in the growth and condition of mussels in The Wash was witnessed.

The SWEEP project was established to develop a better understanding of the factors and their interactions affecting the shellfish populations in The Wash. The study has changed over time, but has involved the collection of meat yield data from mussel lays, long-term monitoring of productivity and basic water quality parameters to identify variations in resources available to bivalves and environmental factors likely to influence their physiological processes, as well as short-term projects investigating localised depletion of food resources around natural beds and lays (Jessop *et al*., 2009; Jessop *et al*., 2010; Jessop and Maxwell, 2011).


***Figure 1.*** The Wash embayment in relation to the British coastline (Insert)

## 1.2 Project materials and methods

In previous years, SWEEP has involved collecting data on temperature, salinity, turbidity and chlorophyll-a at several sites using two sondes, the YSI 6920 and the YSI 6600. This sampling involved a combination of monthly spot sampling at a number of sites and continuous in-situ sampling by the YSI 6600 at the buoy site (52° 56.609' N, 000° 19.104' E). Collection of this data was temporarily stopped in 2017 due to problems with the sondes and associated components. Sonde sampling is due to restart in early 2018, following the servicing of the in-situ YSI 6600 and the replacement of the YSI 6920 spot sonde with a YSI EXO1 spot sonde. Once these are in use they will each be used to collect data on temperature, salinity, turbidity, chlorophyll-a and blue/green algae at a number of sites throughout The Wash.

In the absence of the sondes, the 2017 project was less wide-ranging. It encompassed collecting data on meat yield from three sites in The Wash: The Toft, the Wreck and the Thief (Table 1; Figure 2).

***Table 1.*** Locations of the Toft, Wreck and Thief sampling sites where mussels are collected for meat yield calculation for the SWEEP project

| Station | Latitude | Longitude |
|---|---|---|
| Toft | 52° 57.331'N | 000° 08.115'E |
| Wreck | 52° 52.500'N | 000° 13.100'E |
| Thief | 52° 51.700'N | 000° 17.700'E |

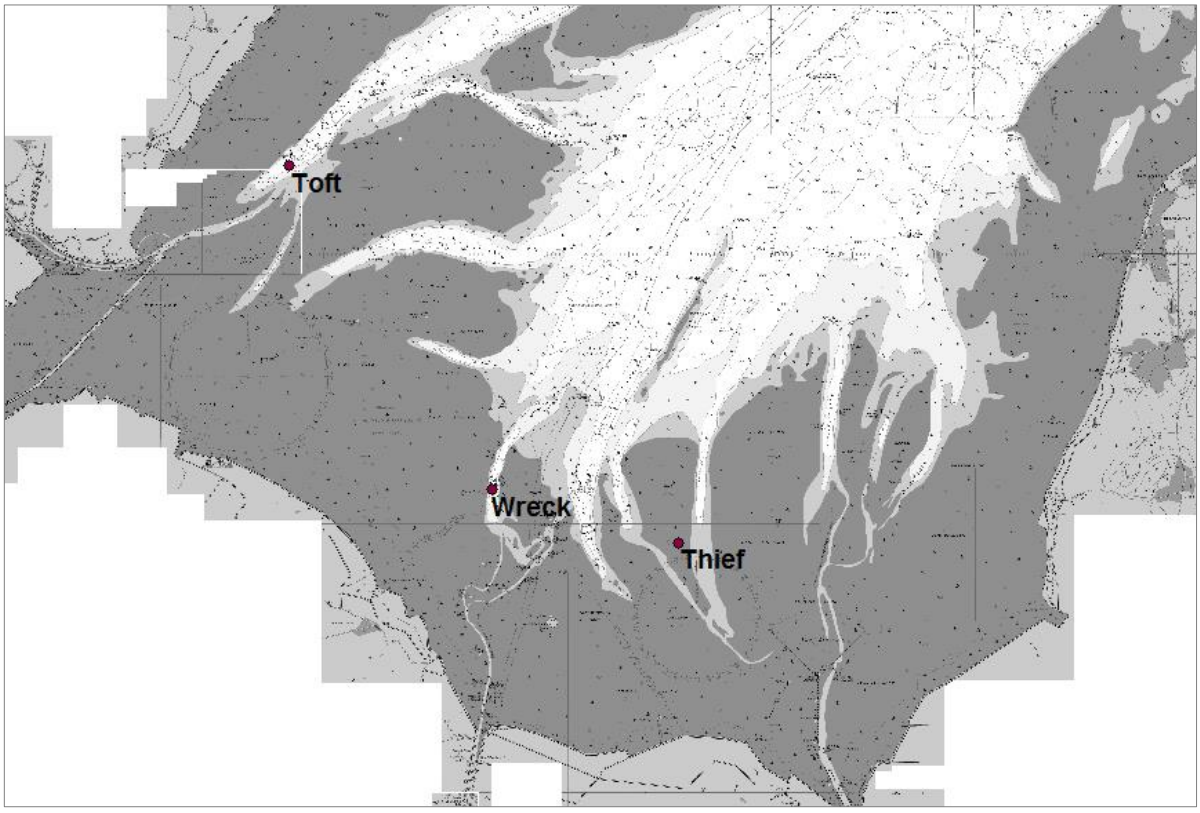


***Figure 2.*** From left to right: The Toft, Wreck and Thief sampling sites within The Wash embayment. Chart should not be used for navigation.

To calculate meat yield (Eq. 1), officers collected a clean one-kilogram sample of mussels ranging from 45 mm to 55 mm shell length from each of the Toft, the Wreck and the Thief monthly, while collecting bivalves for bacteriological and biotoxin sampling (this sampling is also undertaken monthly to maintain the classification of sites for fishing).

$$Meat\ yield\ (\%) = \left(\frac{Mass\ of\ cooked\ meats\ (g)}{Mass\ of\ uncooked\ whole\ mussels\ (g)}\right) \times 100 \qquad \text{(Eq. 1)}$$

## 2.0 Results

### 2.1 Meat yields on the Toft

The Toft was temporally well represented in 2017, with samples collected on ten months of the year. Average meat yield on the Toft over the ten months that samples were collected was 18.29 ± 5.31% (1σ), well above the trigger level of 8.7% meat yield (Figure 3). Trigger levels were set using all-time-low data for meat yields. Meat yields on the Toft dropped to their lowest levels (10.0%; May) during spring and early summer (May to June), before increasing steadily until September and peaking in November at 28.9%.

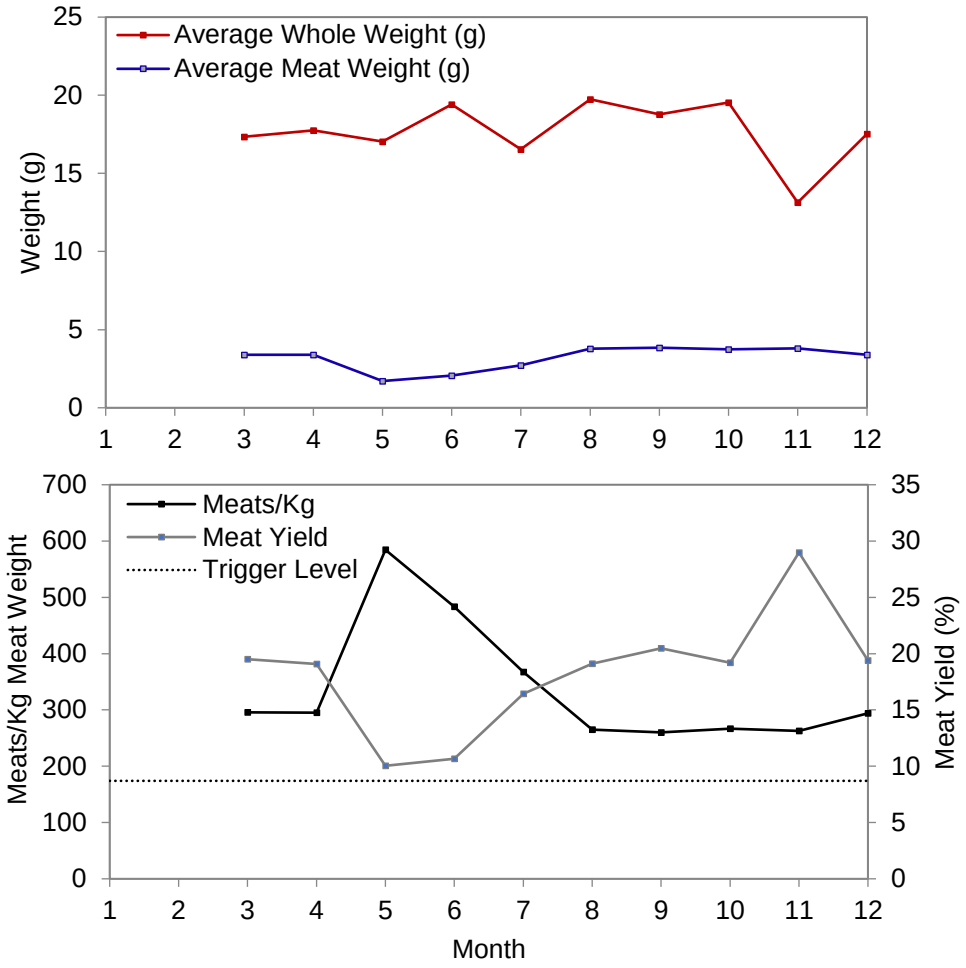


***Figure 3.*** Average whole weight and meat weight (top) and number of meats per kilogram meat weight and meat yield (bottom) of mussels on the Toft from March through to December 2017. Trigger level is set at 8.7% based on all-time low records.

## 2.2 Meat yields on the Wreck

Samples were only collected from the Wreck in May, June, July and December 2017 (Figure 4). Meat yield consistently remained above the trigger level of 11.5%, at a minimum of 12.86% in May 2017. The highest meat yield recorded over the four months that sampling occurred was in December, when the meat yield was 21.8%.

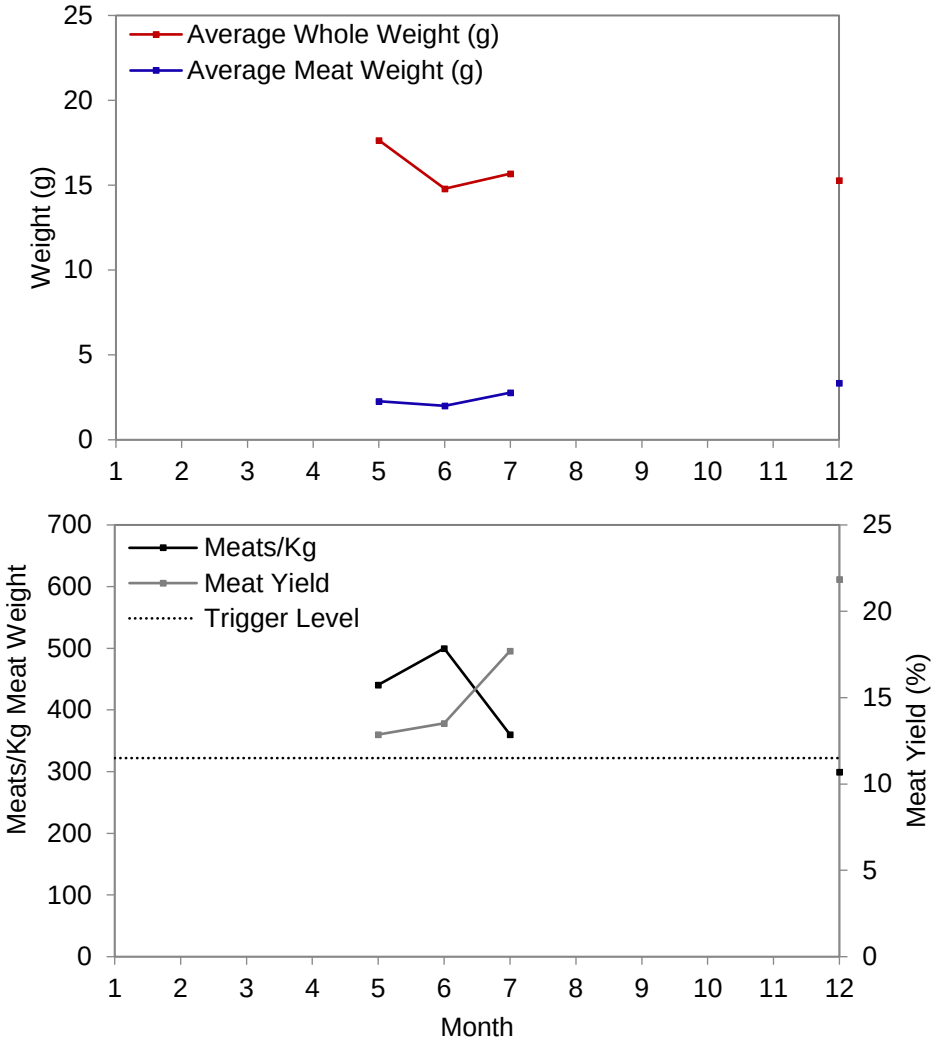


***Figure 4.*** Average whole weight and meat weight (top) and number of meats per kilogram meat weight and meat yield (bottom) of mussels on the Wreck in May, June, July and December 2017. Trigger level is set at 11.5% based on all-time low records.

### 2.3 Meat yields on the Thief

Just a single sample was collected on the Thief in May 2017. At 14.17% the meat yield remained significantly higher than the trigger level of 9% (Figure 5).

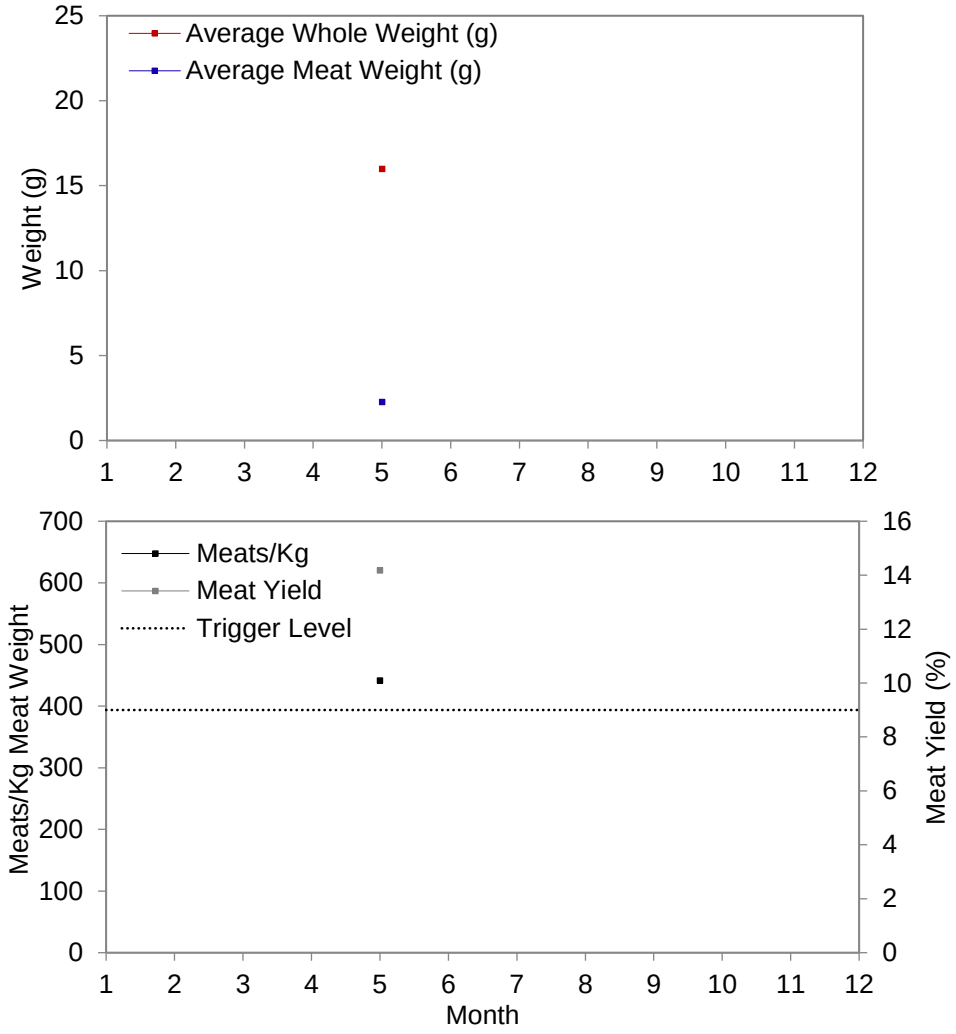


***Figure 5.*** Average whole weight and meat weight (top) and number of meats per kilogram meat weight and meat yield (bottom) of mussels on the Thief in May 2017. Trigger level is set at 9% based on all-time low records.

## 3.0 Discussion

The spring decline in meat yields is to be expected as mussels tend to spawn in the spring, causing flesh mass to decrease. The November peak in meat yield (28.9%) seen on the Toft, and the relatively high meat yield of 21.9% in December on the Wreck are more difficult to explain. Feeding levels are usually high during the summer and low during autumn and winter (resulting in reduced flesh mass). Previous November records from the Toft include meat yields of between 15% and 17% (Strigner, 2014). In the absence of data on chlorophyll, temperature, salinity and turbidity, it is difficult to explain this anomaly.

In 2017, meat yield sampling was somewhat neglected on the Wreck and Thief sites, often due to the prioritisation of EHO sampling over the SWEEP project and other logistical issues. Despite low coverage on the Wreck and the Thief, all meat yield data available did show meat yields above trigger levels for each site, suggesting there is not currently a major cause for concern. This data is supported by the results of the 2017 mussel stock assessment, which recorded the natural mussel beds in The Wash at their highest in over 20 years.

The poor temporal coverage of samples in 2017 has led to an absence of valuable data regarding the condition of mussels in the Wash, and therefore little opportunity for comparison between the beds and with other years. In 2018, Eastern IFCA will look to place greater emphasis on the importance of collecting these samples. This is particularly important as sonde water quality monitoring is due to resume in early 2018 and will need to be supported by meat yield data to fully understand the processes influencing the Wash bivalve populations.

## 4.0 References

Jessop, R.W., Harwood, A.J.P and Woo, J.R., **2009**. Eastern Sea Fisheries Joint Committee Research Report.

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