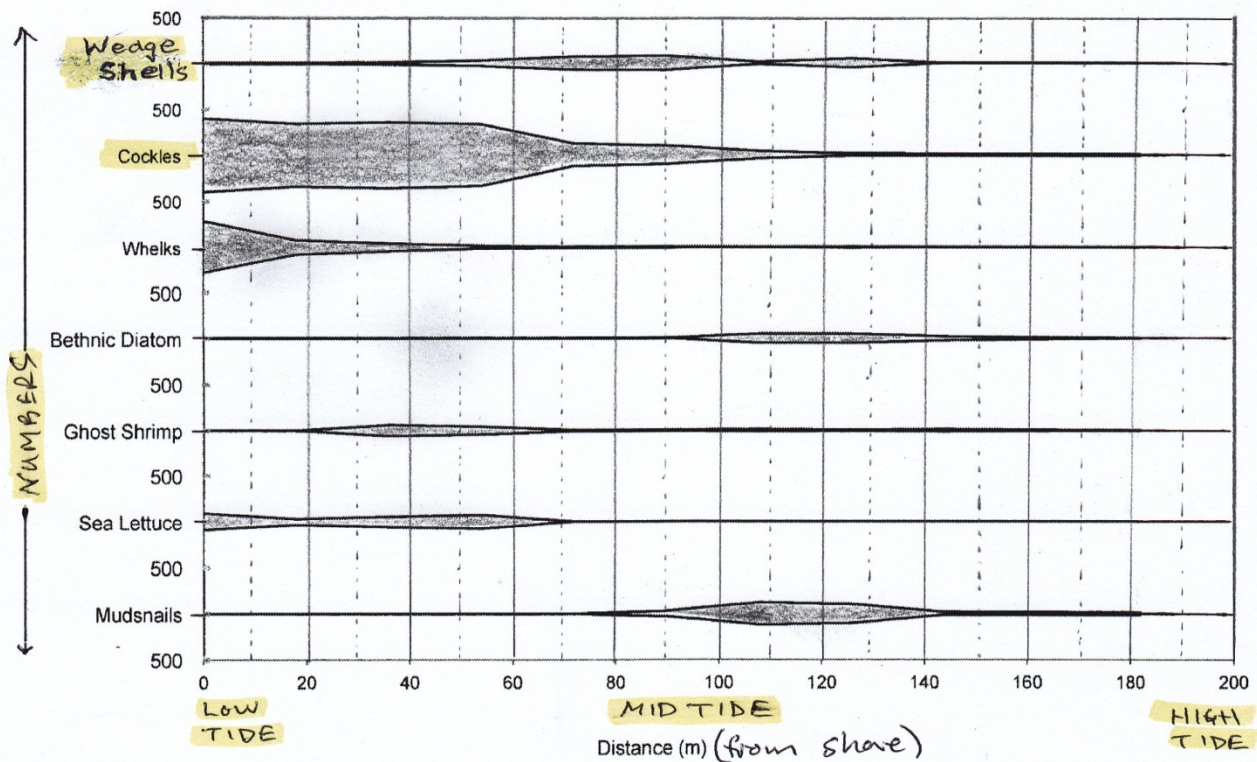


Please note – These are extracts from one student’s response

*Class Results: Kite graphs showing distribution of species from low tide water mark at Mahara Bay Estuary on 26 February 2014*



The collated class results came from field work done by 10 groups at Mahara Bay estuary. Transect lines were placed at right angles to the low tide and samples taken at stations every 20m using a 0.5m x 0.5m quadrat. At each station, all organisms on the surface were identified and counted, before digging up the whole quadrat to a depth of 0.1m and counting organisms found in that. We recorded substrate and habitat type at each station.

My investigation focus was to analyse the community pattern within the Mahara Bay ecosystem. Mahara Bay is an estuary formed where freshwater from rivers and streams mixes with salt water and flows into the Pacific Ocean. The habitat is mainly mudflats, coastal wetlands formed when mud is deposited by tides or rivers. The temperature of the water is important because it affects the amount of dissolved oxygen the water can hold. Aquatic organisms are dependent on dissolved oxygen for their survival in this ecosystem. The main abiotic factors include tidal movement (aerial exposure) and the sediment composition within the estuary. 2

1 The community distribution pattern shown by the results in the class kite graphs is zonation. The analysis of the data and information provided shows that there is spatial pattern of distinct horizontal bands of organisms from the low to the high tide. This pattern is shaped mostly by the abiotic factor of daily tidal movement meaning that some organisms living in this community are affected by prolonged periods of aerial exposure. 2

2 Another abiotic factor that we found was the substrate (sediment) composition in different zones of the mudflats. A biotic factor that influenced the pattern was inter-specific

5 competition between species, particularly in the low tide area. For example, cockles, whelks and wedge shells.

Two species I have chosen that show an interrelationship in this community are cockles (*Austrovenus stutchburyi*) and wedge shells (*Macomona liliana*).

1 Cockles were found in the low and mid tidal zones, up to 120 m. They are most abundant from 0 m – 60 m, as this area is covered by sea water longer than the other zones. They live just below the substrate surface in muds of fine sand at the low tide, and sandy silts in the intertidal zone. 2

4 Cockles are bivalve molluscs. They require oxygen for respiration to provide energy all their life processes, and a source of food for nutrition. They have structural adaptations to carry out gas exchange and feed. Gills have a large surface area, and allow them to carry out gas exchange efficiently underwater by removing oxygen that has been dissolved from the air. They have two similar shells hinged together by a strong ligament that allows them to seal themselves and the water inside the shells, to keep the gills moist at low tide. The gills do two jobs – take in oxygen and filter out fine food particles like diatoms (phytoplankton). Tiny hairs wave the water containing oxygen and direct these food particles towards the mouth. 3

4 Cockles are filter feeders, found just below the surface of the mud with siphons opening just above. When the tide comes in they draw seawater carrying food in into its outer body cavity through its 'inhalant' siphon. They push the water out through its 'exhalant' siphon. Large particles are removed by palps and redirected to the exhalant stream. When cockles are feeding, their siphons can be seen above the surface sediment. Both siphons are designed to give the cockle structure and direction in the inhaling of water and food and the exhaling of waste. These siphons mean that when the cockle is feeding, it does not have to bring itself out of the mud and risk exposing itself to predators. The siphons mean the process of feeding is efficient, ensuring the cockle can feed as much as possible when it is high tide. These structural adaptations help the cockle to have an efficient system in terms of exchanging gasses, feeding and gaining nutrition to carry out its numerous life processes. 3

1 Wedge shells are large bivalve molluscs. They are surface deposit feeders that were found from 40 m – 140 m, most abundant between 60 m – 100 m. Wedge shells are also filter feeders, but feed on the organic matter on the mud beds as well. Adults can have a strong effect on many other sediment-dwelling organisms living nearby. Their distribution overlaps with cockles, meaning there is interspecific competition between them with cockles. 5

5 The distribution data shows that wedge shells have a wider zone of tolerance than cockles, as they were found to be more abundant on the mid-tide zone. This is where the cockle distribution became less dense as there is less time to feed and carry out gas exchange. At this upper limit the cockles would be entering a zone of physiological stress. However, wedge shells are better adapted to live and carry out feeding in this zone.

Gause's competitive-exclusion principle states that no two species with identical niches can co-exist for long in the same place. At the Mahara Bay estuary, the cockles' ability to filter feed means that they were more abundant in the low tide zone. Wedge shells also filter feed, but they were found mainly in the mid tide zone as they are able to physiologically tolerate abiotic factors such as aerial exposure due to tidal movements better than cockles. 5