

Monitoring the Medina Estuary

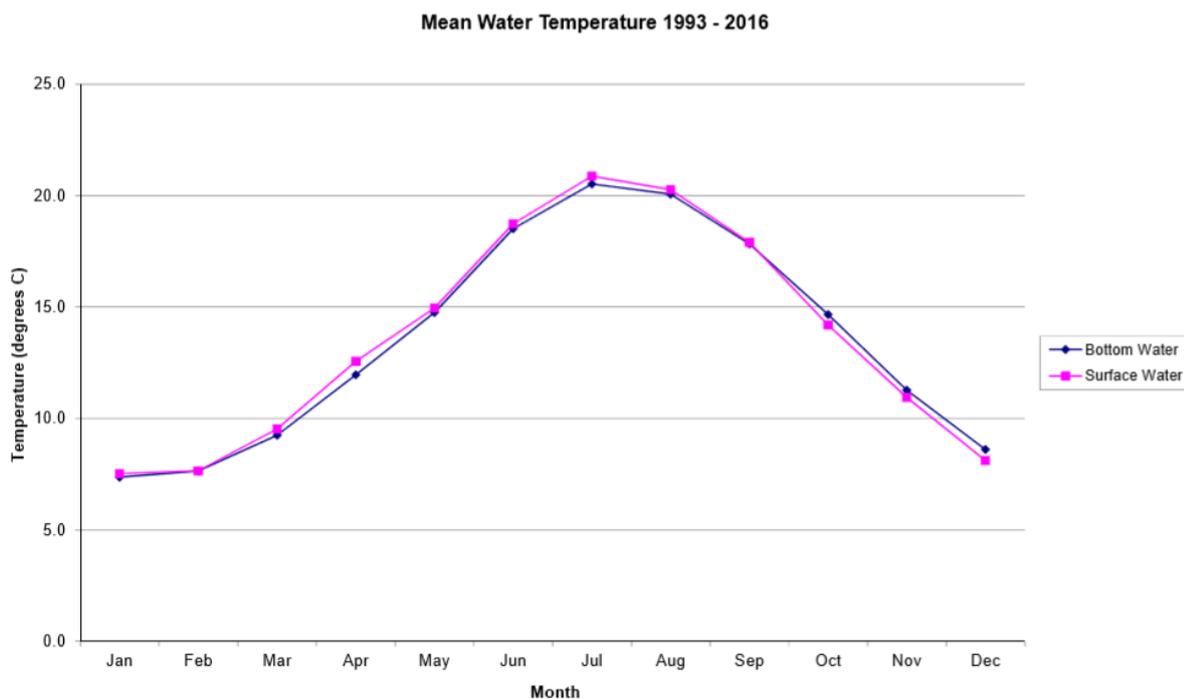
We are involved with monitoring studies in the valley, including the recording of changes in the estuary. We collect water samples on a regular basis and measure the salinity, temperature and use a Secchi disc to measure the turbidity.

Estuaries are very dynamic ecosystems and the Medina estuary exhibits both temporal and spatial changes. Depending on the conditions, stratification is sometimes exhibited.

The estuary is a Site of Special Scientific Interest (SSSI), and has International and European designations to protect the birds, especially during the Winter months.

The source of the River Medina is at Chale, in the south of the Island, and flows north to Newport, where it becomes tidal. The Medina Valley Centre is situated on the west bank of the estuary, 2km from Newport. We have been monitoring the estuary since 1993, taking water samples and keeping records of the temperature, salinity and turbidity. Water samples and measurements are taken at or near to high tide from the end of the pontoon, where there is a tide gauge levelled to chart datum. Samples from the bottom of the estuary are obtained using a Cassella bottle and turbidity determined with a Secchi Disc. Water temperature is measured using a thermometer and salinity determined using a hydrometer and standard conversion tables.

Temperature

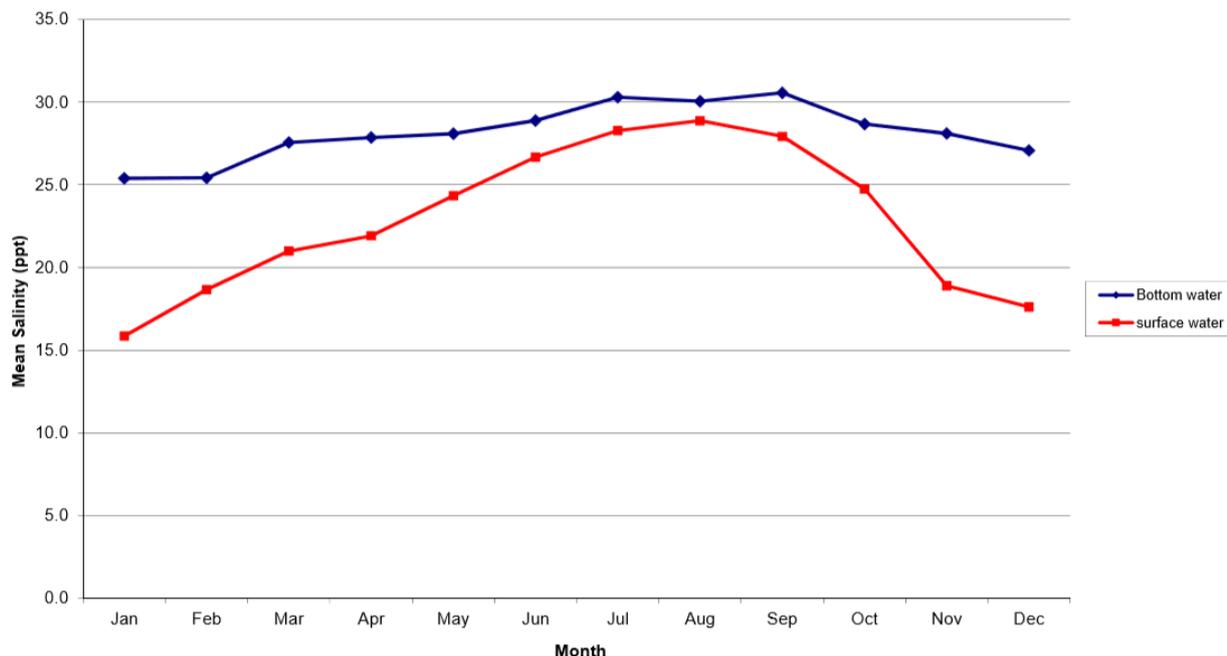


Monthly changes in surface and bottom water temperature off the Medina Valley Centre are shown below. Minimum surface temperatures occur in January. In summer, samples from the bottom are not so warm and in winter they are not so cold.

Salinity

Salinity is very dependent on the volume of freshwater flowing into the estuary and, in the case of the Medina, this is relatively small. There is a recognisable salinity gradient between Newport (fresh water) and the Folly Lake (see Table 1). The surface salinity of the open sea is 34-35 ppt, at the Folly Lake it is frequently 32-33 ppt. Salinity of the bottom samples is nearly always higher than the surface as a consequence of the greater density of salt water compared with fresh water. Variability within the water column is shown most clearly in the upper estuary. After heavy rain, the estuary is more dilute and salinities of less than 5 ppt have been recorded off Medina Valley Centre. Low salinities also occur locally near the Fairlee sewage outfall and at Dodnor Creek, where fresh water flows through sluices in the sea wall.

Mean Monthly Salinity 1993 - 2016



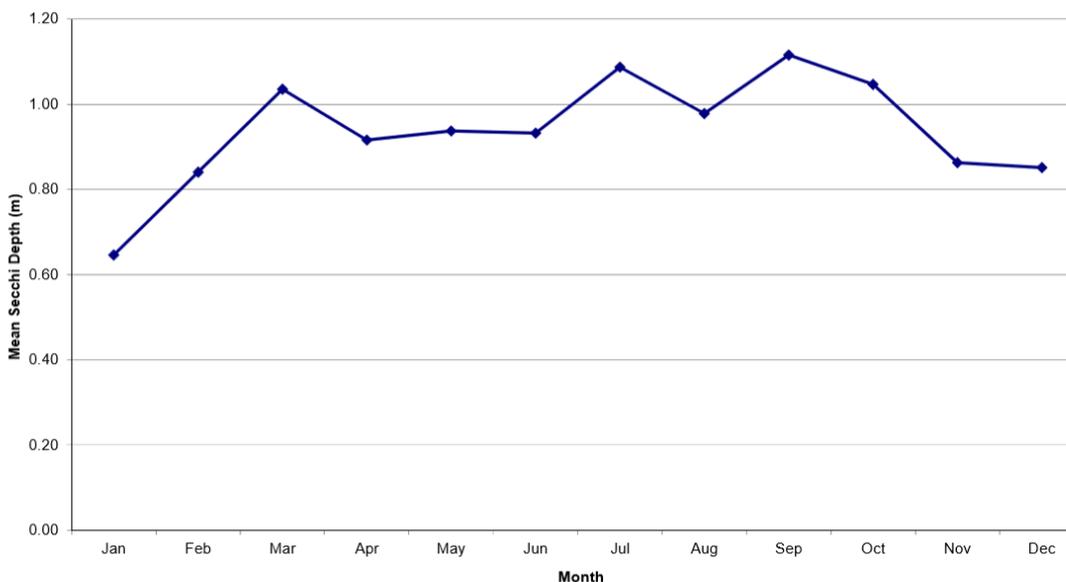
Seasonal changes in salinity are shown below. The salinity of surface water is more variable than that at the bottom, but both surface and bottom show a discernible increase during the summer months as a result of reduced rainfall and higher evapo-transpiration. Over a tidal cycle, salinity would be expected to rise on the flood tide and decrease on the ebb. Studies at Medina Valley Centre have generally shown this to be the case, but anomalies are frequent. On an ebb tide high values are maintained until close to low tide as a result of saline water draining off the mudflats.

The Medina is referred to as a positive estuary because the volume of water entering from the river and land drainage is greater than the evaporation from the surface. This is typical of temperate regions. The outgoing fresh water floats on top of the salt water entering from the sea, but a gradual mixing takes place vertically from the bottom to the top. The tidal inflow is greater than the fresh water flow so, as a result, the surface waters have some degree of salinity. Fresh water will only be found near to the head of the estuary, except in times of heavy rain (McLusky, 1989).

Turbidity

The turbidity of the estuary is highly variable. It is influenced by rainfall, sewage discharge, wind speed, disturbance by boats and abundance of plankton in the water column.

Monthly Secchi Depth 1993-2016



There does not appear to be a seasonal pattern although the highest values of turbidity (the least depth to which the Secchi disc can be lowered and remain visible) appear during the wettest months in autumn and winter. It is generally possible to see 0.8m below the surface, but following very heavy rain the estuary becomes orange in colour as a result of soil erosion in the upper Medina valley. In such conditions it is not possible to see more than a few centimetres below the surface.

Conclusions

Estuaries are highly changeable – there is considerable variation in salinity, temperature and turbidity. Rising sea levels and climate change may alter the physical parameters of the estuary, which could have important consequences for flora and fauna.

References

McLusky, D.S. (1989) *The Estuarine Ecosystem*, 2nd Edition. Blackie.

Riley, A.E. & Herbert, R.J.H. (1998) Measurements of temperature, salinity and turbidity of the Medina Estuary 1993-1997 in Medina Valley Wildlife 1997 Report, MVC.