The Ecological Effect of Swinging Moorings in the Folly Reach, Medina Estuary

(The following article is taken from a Report to the Environment Agency by Herbert *et al*, 2000)

This study was initiated by the Environment Agency in response to the Land Drainage Consent application by *Aerolaminates* for their Marine Transfer Facility (MTF) in the Medina Estuary. The MTF crosses intertidal mudflats which are one of the components of the Solent & Southampton Water cSAC/SPA/Ramsar site. To offset the loss of intertidal habitat following construction of the MTF and associated dredging activities, a mitigation package was agreed with the IOW Council that included the removal of moorings within the Folly Reach of the Medina Estuary.

Chain and buoy moorings in the Folly Reach of the Medina estuary, together with boats attached, were believed to be causing mechanical damage to the surface of intertidal habitats as they swing around their anchor point. This would be reflected in a general impoverishment of the fauna, with reduced species abundance and/or diversity. Therefore, swinging moorings within the intertidal range could impact on the quality and extent of the habitat designated as cSAC and potential bird feeding areas within the SPA and Ramsar site.

The agreed proposal within this part of the mitigation package was therefore to remove nine moorings at MLWS on the eastern side of the Folly Reach and to monitor the recovery of the invertebrate fauna, should initial differences between affected and unaffected regions be observed.

Methods

Fieldwork and sample preparation

Prior to the removal of the moorings, two mooring buoys were selected. The two buoys were 30cm diameter and anchored about 70m apart. They were attached to 2m of rope and approximately 5m of 5/16" galvanised steel chain that was shackled to concrete blocks buried in the mud. According to the Harbour Master at Newport, the moorings had not been let during the summer of 2000.

On 29th September 2000, two separate patches of 5 samples were taken within the chain diameter of each buoy. Patch diameter was about 1.5m; core diameter was 10cm and sampling depth 15cm. At the same tidal level, but 2-4m beyond the chain radius of each buoy, five core samples within each of two patches were also taken as controls. This hierarchical sampling design was chosen so that any differences found between areas with and without buoys could be confidently attributed to the buoys rather than small-scale variation in community structure. Samples were processed using a 0.5mm sieve and the animals preserved in 5% formaldehyde in seawater prior to identification. An analysis was also carried out to determine the sediment composition of the mudflats.

Results

The fauna was typical of that found at lower tidal levels within this part of the Medina Estuary where it experiences a relatively high mean surface salinity of between 30-33ppt. Samples were dominated by oligochaete worms *Tubificoides* spp., polychaete worms

Neanthes virens and *Cirriformia tentaculata*, and burrowing shrimp *Corophium volutator*. There were also burrowing bivalve molluscs such as the cockle *Cerastoderma edule* and Baltic tellin *Macoma balthica*. On stones and upon the surface of these mollusc shells were epifaunal species including the anemone *Sagartia troglodytes*, barnacle *Elminius modestus* and chiton *Lepidochitona cinereus*. One species, the polychaete worm *Anaitides mucosa*, while common elsewhere in the Solent has not previously been recorded in the Medina Estuary.

A total of 21 taxa were identified in the samples; 19 species occurred in the areas scraped by buoy chains and 15 occurred in the control areas. Although more species occurred in the areas scraped by buoy chains there were no statistically significant differences in diversity indices. There was, however, a significant difference in the community structure: the majority of species occurring only in the areas scraped by buoy chains were crustacea, including barnacles. Bryozoa (sea mats) also occurred exclusively in those areas, but the small gastropod mollusc *Hydrobia ulvae* and the annelid worm *Anaitides mucosa*, which occasionally occurred in control areas, were absent in areas with buoy chains.

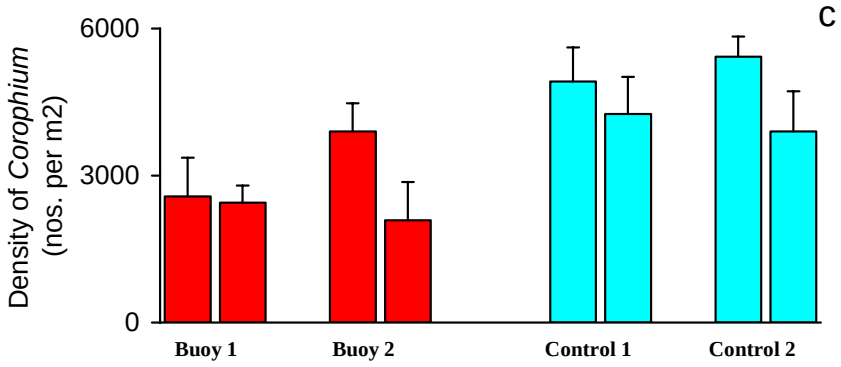


Fig.1. Density of the burrowing shrimp *Corophium voluator* in two patches in the vicinity of two mooring buoys and two control areas. The density within the chain radius of the mooring buoys was significantly lower than in control areas.

The abundance of the burrowing amphipod shrimp *Corophium volutator* was significantly less in the areas affected by the buoys, being reduced in mean density by 40% (Fig.1).

Discussion

The fact that there were significant differences in community structure between samples from areas near buoys and samples from control areas indicates clearly that the buoy chains have an impact on the fauna. However, although not statistically significant, the effect of the buoys is to cause a small increase in diversity from 15 to 19 species. Moreover the abundance of most worm species which are likely to be important prey items for wading birds, tends to be greater amongst the buoys. The tube dwelling amphipod shrimp *Corophium volutator* was however significantly less abundant amongst the buoys compared to control areas.

It is suggested that the effect of the swinging mooring chains scraping over the mud surface is to modify sediment composition favouring the greater prominence of larger particles such

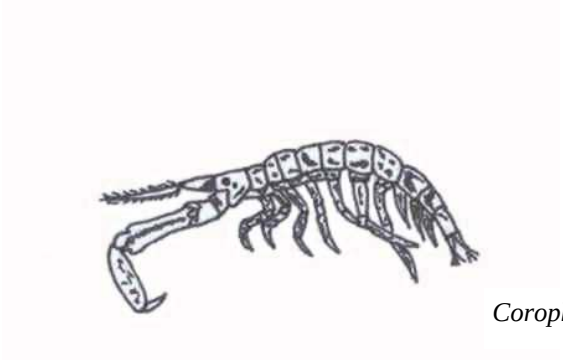
as gravel and shell fragments. These were certainly more evident in the sediment samples obtained from around the buoys. Epifaunal species attached to stones and shells such as the barnacle *Elminius modestus* and chiton *Lepidochitona cinereus* were found only in the areas affected by the buoys. Species requiring fine stable sediments such as the burrowing amphipod *Corophium volutator*, a filter and deposit feeder on the mud surface, were significantly more abundant in the unaffected control areas.

Clearly, the 40% reduction in abundance of *Corophium* in the vicinity of moorings reduces the potential food resource for various species within the SPA. The greater abundance of other species of polychaetes and oligochaetes within the chain radius of the buoy may be as a consequence of the modification of the sediment or reduced predation intensity, perhaps due to effects on bird behaviour. Although no studies of the effects of mooring buoys on wader feeding behaviour have been published, personal observations suggest that foraging does occur. Within 20m of our sampling, 3 Turnstone (*Arenaria interpres*) were observed feeding amongst and outside of mooring chains near the low water mark. In the early autumn (September 29th) when the samples were taken, there were intermittent large flocks of wading birds on passage in the vicinity.

Of course the scouring caused by anchor chains is just one of several possible impacts of a mooring. The scouring due to tethered boats has not been examined and that may vary considerably according to hull type, e.g. bilge keel, fin keel, Dory etc. There is of course the issue related to the area of mud (and potential bird feeding resource) occupied by boats 'drying out' at low tide. The movement of boats and human disturbance while in use may also be significant. There may also be a significant impact on the sub-tidal benthos from deep water swinging moorings. Considering the greater use of deep-water moorings in estuaries, any depletion of the fauna within these habitats may influence the biological quality of the cSAC.

From:

Herbert, R., Crowe, T. & Sheader, M. (2000)
Benthic Survey to determine the effect of swinging moorings in the Folly Reach, Medina Estuary, IOW. Report to the Environment Agency 25pp. Medina Valley Centre, Newport, Isle of Wight.



Corophium volutator