

Evidence for damage to marine habitats: a literature review.

Serpulid Reefs (Serpula vermicularis)

Introduction:

The calcareous tube-forming polychaete worm, *Serpula vermicularis* is common in Europe. In most places the worms are solitary with the base of the tube attached to stones or shells, and the feeding end growing up into the water. However, Lochs Creran and Teacuis, Scotland are the only known remaining locations in the UK where mass aggregations of individuals occur, producing reef-like structures growing to 1m in height (Moore et al., 2006). Loch Creran was designated a Special Area of Conservation (SAC) under the EC Habitats Directive in March 2005, in order to protect reefs of *Serpula vermicularis* and the horse mussel *Modiolus modiolus*. Loch Teacuis lies within the Sunart SAC which was designated to protect rocky reefs. Recently, Loch Creran was completely closed to scallop dredging and to nephrops trawling by vessels over 10m and fishing prohibited completely in the areas where reefs are present. Nephrops trawling by vessels under 10m and creeling will be able to continue, however, in those areas of the site where there are no reefs.

The importance of *Serpula vermicularis*:

Loch Creran is of international conservation importance for its biogenic reefs. Until very recently, it was considered the only site in the UK known to support calcareous serpulid reefs and is the most important world site for serpulid reefs in terms of areal coverage (Moore et al., 1998). In 2007, well-developed reefs of *S. vermicularis* were also discovered in Loch Teacuis, although these are not as dense as those in Loch Creran (SNH, 2007). Serpulid reefs are listed as a priority habitat under the UK Biodiversity Action Plan (UK BAP). The reefs provide a habitat for other marine wildlife on the muddy seabed where there is little other solid attachment, and become covered with orange sponges, colonial and solitary sea squirts, hydroids and seaweeds (Holt et al., 1998). The motile component of the macrofaunal community is rich in amphipods and includes, fish, crabs, whelks and echinoderms which use the reef for feeding, refuge and egg-laying (Moore et al., 1998). Although no detailed community studies have been published, Poloczanska et al. (2004) used underwater television observations to show a rich diversity of mobile fauna using the serpulid reefs in Loch Creran, including juvenile cod, which appeared to migrate to the reefs at night and are known to use inshore coastal areas as nursery areas (e.g. Gibson et al., 1996).

Evidence of damage to *Serpula vermicularis*:

Serpula vermicularis reefs were recorded in Linne Mhuirich, an extremely sheltered lagoon within Loch Sween, Scotland (Bosence, 1979; quoted in Moore et al., 1998). Subsequent examinations of Linne Mhuirich failed to reveal any living reefs, and only the empty remains of reefs were found (UK Habitat Plan for serpulid reefs).

The fragile nature of serpulid reefs renders them vulnerable to mechanical damage from a number of activities, including fishing, aquaculture, boat mooring and discharge of waste products (Moore et al., 2006). An alginate factory at Barcaldine on the shores of Loch Creran has discharged powdered brown algae over a number of years, although such discharges ceased in 1996. Much of this material has coated the seabed in the vicinity of the effluent pipe, giving rise to an extensive surface mat of the sulphur reducing bacteria, *Beggiatoa* and eliminating reefs for a distance of about 1 km (Moore et al., 1998), and these authors also suggested that alginate discharge may have reduced reef development at greater distances.

A number of activities with strong potential for damage occur in Loch Creran, including otter trawling for *Nephrops* and scallop dredging, including in areas where serpulid reefs would be threatened. Static fishing includes the occasional use of creels for *Nephrops* and velvet crabs, and weighted drums for whelks. In addition, oyster, mussel and salmon farming are carried out in Loch Creran and there is further potential for damage from small boat moorings and anchoring. Moore et al. (1998) found no evidence that pollution from fish farming was adversely affecting reef development, as salmon cages were deployed at sites which were too deep for the establishment of reefs. They concluded that the main threat to the serpulid reef population is physical disturbance. Aquaculture moorings (fin fish and shellfish) have damaged serpulid reefs from dragging by mooring weights and chains (Moore et al. 1998; Moore et al., 2006). In addition, the usual depth of anchoring by small boats also coincides closely with the depth range of serpulid reefs. Moore et al. (1998) recommended that the prospects of continued survival of reef would be improved by the exclusion of anchoring from certain areas of Loch Creran. The majority of trawling in the loch takes place in deeper areas where no reefs are present. Dredging however, represents a much greater potential threat, with a number of dredge tracks identified by Moore et al. (2006). These dredging tracks, which were up to 6m wide, were heavily fouled with ascidians and red algae, potentially preventing significant recruitment by *Serpula vermicularis* and thereby delaying future recovery.

Conclusion:

Serpulid reefs of national and international importance and provide an important habitat in areas of the seabed where there is little other solid attachment. These habitats are easily disrupted by environmental change and physical damage by human activities. Moreover, serpulid reefs show high biodiversity, potential acting as nursery grounds for commercial species such as cod and edible crabs. The designation of Loch Creran as an SAC, and the recent closure to fishing in the vicinity of the serpulid reefs should protect this important habitat.

References:

- Gibson, R. N., Robb, L., Burrows, M. T. and Ansell, A. D. (1996). Tidal, diel and longer term changes in the distribution of fishes on a Scottish sandy beach. *Marine Ecology-Progress Series* **130**, 1-17.
- Holt, T.J., Rees, E.I., Hawkins, S.J. and Seed, R. (1998) Biogenic Reefs (volume IX). An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Scottish Association for Marine Science (UK Marine SACs Project). 170 pp.
- Moore, C. G., Saunders, G. R. and Harries, D. B. (1998). The status and ecology of reefs of *Serpula vermicularis* L-(Polychaeta : Serpulidae) in Scotland. *Aquatic Conservation-Marine and Freshwater Ecosystems* **8**, 645-656.
- Moore, C.G., Saunders, G.R., Harries, D.B., Mair, J.M. Bates, C.R. and Lyndon, A.R. (2006) The establishment of site condition monitoring of the subtidal reefs of Loch Creran Special Area of Conservation. Scottish National Heritage Commissioned Report No. 151 (ROAME No. F02AA409).
- Poloczanska, E. S., Hughes, D. J. and Burrows, M. T. (2004). Underwater television observations of *Serpula vermicularis* (L.) reefs and associated mobile fauna in Loch Creran, Scotland. *Estuarine Coastal and Shelf Science* **61**, 425-435.
- SNH (2007). Scotland's Natural Heritage No.27 (Spring 2007). 36 pp.
- UK Habitat Action Plan for serpulid reefs (<http://www.ukbap.org.uk/UKPlans.aspx?ID=43>).

For further information please contact.

Alan Wells

Marine Bill Research Officer, Scottish Environment LINK

Tel: 01350 728200, Mobile: 07920 287086, Email: alan@scotlink.org