



- Protected Areas SAC, SPA, SSSI, Ramsar, NSA
- Commercially important fish spawning and nursery areas
- Distribution of endangered species
- Distribution of species sensitive to aquaculture
- Shannon-Weiner index for macro-benthic fauna.

After developing individual, rasterized, geo-referenced layers for each of the biodiversity indicators, each component was weighted and combined through a MCE (see Fig. 1).

### **Results**

The resulting model is shown in Fig. 2. Areas with highest overall biodiversity (indicated by deep red areas) can be found in numerous parts of the Western Isles. Many of these areas are important for present and future development of aquaculture. The model confirms areas previously known to have a high biodiversity (such as Loch Roag in the north-west of the Islands), but also highlights other areas of high biodiversity not previously considered.. The outputs from this model can be used in conjunction with other GIS-based models, to quantify vulnerability of biodiversity, and hence the potential ecosystem sustainability, to proposed aquaculture developments.

### **Discussion**

The Biodiversity model developed here can be used to assess the ability of coastal sites to incorporate aquaculture activities while ensuring that the relevant biological criteria such as species diversity, sensitive environments and species, and fishery nurseries are considered. A larger GIS framework for coastal zone management of aquaculture site suitability (see Fig. 3), is under development at the Institute of Aquaculture, Stirling. This global model incorporates physical environmental parameters, cage engineering, interactions with biodiversity, waste dispersion effects. The grading of suitability can be used as a decision support system for environmental managers and regulators for the effective siting and management of aquaculture systems. This type of model has the potential for expansion in both geographical and information terms, allowing more spatial models on other relevant information to be included for other aspects of aquaculture production and development in Scotland or elsewhere.