Chairman's Summary

Implications for Salmon Management

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After two and a half days of listening to the highly professional and fascinating scientific data collected during the SALSEA programme, the final presentation session at the Salmon Summit sought to extricate the management potential from all that information. The following is a summary from the 7 papers presented.

Although SALSEA looked primarily at marine issues, it is important to remember that mortality occurs during all of the salmon's life stages, and so the freshwater phase cannot be divorced from the marine. This is especially important in the face of climate change, whose potential impact looms over most of the issues affecting Atlantic salmon, but especially those in freshwater, estuarine and coastal areas. Water temperatures in the salmon's southern range may rise by up to 7°C over the coming century, and the ability of the species to survive the inevitable environmental change will be critical in this region. In the USA, for example, the salmon's southern range has already receded northwards by two degrees latitude.

Temperature change in fresh water has already caused issues, including increasing the growth rate of parr, leading to younger smolts and an earlier timing of their seaward migration. Land management practices have led to sub-lethal pollution in some freshwater systems, for instance from agricultural chemicals, causing significant mortality in smolts as they enter sea water. Barriers to migration are also a major limiting factor for salmon production throughout its entire range, and will surely become more significant as climate change alters flow regimes at critical return run times.

The main practical message derived from this data is that the freshwater environment is critical to marine survival, and is more amenable to management. It is, therefore, crucial that freshwater management is programmed to mitigate as much as possible against human environmental interference, and that, to give this maximum impetus, scientists and managers should work together as closely as possible, both nationally and internationally, rather than in isolation.

Salmon could react to climate change in three ways:

- some populations, especially in southern regions, might not respond quickly enough, or at all, and so could face extinction;
- some populations might disperse and re-colonise elsewhere;
- others might adapt *in situ* and increase their tolerance to temperature increase.

It is, therefore, important that managers try to optimise the evolutionary potential of salmon stocks, for instance by slowing down the warming process from increased solar energy in fresh water by providing increased bank-side shading. This will be aided by ensuring that excessive water abstraction is minimised, thus encouraging maximum flows in warmer months.

Genetic monitoring has shown that Western and Eastern Atlantic salmon populations are distinct, albeit with some limited introgression. The Western stock is split between Maine (USA) and Canada, and there are three distinct European stocks. It is important to retain genetic integrity within management options – for instance, stocking has potentially serious implications for natural gene banks, and probably only serves to feed an existing bottleneck anyway. Far better to remove the bottleneck, where possible, and allow natural restoration of stocks to occur.

Greater stakeholder involvement in salmon management could be crucial for the future. Governments have historically set national policies on a Government-knows-best basis, but local experience and knowledge at catchment level are becoming increasingly important and third sector involvement is gaining strength in many countries. Limiting exploitation at a local level is an obvious method of maximising conservation limits within individual river systems, with bag limits and catch and release both excellent angling tools which encourage a community approach to salmon management and conservation.

However, Governments must still establish sound national policies to create the structure for efficient management action. In the USA, where hydroelectric dams, over exploitation and pollution have historically limited salmon production in fresh water and the ability to sustain marine survival, the Government has imposed stringent conservation measures under the Endangered Species Act. Dams and low marine survival are considered the major issues impeding conservation and restoration efforts. In protected rivers, critical habitat has been designated, with a presumption against any human interference which might impact vulnerable species. Three East Coast Recovery Units, totalling 30,000 habitat units, have been established, with conservation objectives agreed which require 2,000 spawning fish in each unit.

SALSEA has also shown how international agreement might offer some protection to salmon through limiting their exploitation as bycatch within pelagic fisheries for mackerel, herring, blue whiting etc. With more information on post-smolt migration routes and timing now being available, pelagic fishing could conceivably be banned in areas/time zones where salmon bycatch can be predicted and is considered unacceptably high. Similarly, the headlines of pelagic trawls could be limited to below, say, 5 metres of the surface to reduce the possibility of post-smolt bycatch.

Greater knowledge of juvenile salmon numbers in the oceans and the environmental conditions they experience has helped predict salmon runs accurately on North American West Coast Pacific species. This data has allowed short-term management programmes to be adopted in fresh water, and continued post-smolt monitoring could have similar benefits for freshwater management of Atlantic salmon populations.

The final paper suggested that long-term thinking was required for efficient management of Atlantic salmon, especially in the light of changing environments through global warming. Difficult and unpalatable decisions need to be taken, especially with some scientists predicting that, for instance, flows may reduce in individual river systems by as much as 50-80% by 2050. We might have to accept that there are salmon populations which might never return to their former abundance, at least not in any reasonable timescale.

With the exception of the potential to limit bycatch, we can do little to manage the marine environment over such issues as temperature, currents, acidification or salinity. However, as

other speakers had confirmed, there is still much that can be achieved in fresh water and coastal zones to protect the salmon and its habitats, although it should always be remembered that, in a changing environment, other water dependent species may have differing requirements.

Riparian woodland shading could keep water temperatures below lethal levels, and wetland buffering against low summer flows is also a priority. However, there are many competing interests in the aquatic environment, and the most vital ingredient for future salmon management is actually to get the fisheries voice heard alongside those other interests, many of which are industries and activities which decision-makers, and the public, will probably perceive as being of greater importance than salmon conservation. Wherever possible, therefore, salmon management will gain where it can be associated in cooperation with other, seemingly higher profile, interests.

The question of taking difficult, even heretical, decisions was then discussed. For instance:

- How do we change salmon conservation limits so that they are realistic in this changing global environment?
- At what point do we stop stocking salmon into rivers in the expectation of restoring/enhancing salmon runs?
- At what point does a salmon river become non-sustainable?

The final plea was for salmon management to take decisions well in advance of potential stock collapse, and to play its full part in an adaptive catchment/ecosystem approach to management. This will require redoubling of efforts to ensure fisheries are managed rationally, habitat is protected and restored, the risks and benefits from stocking are very carefully evaluated before proceeding, and the threats to the wild stocks from salmon farming are addressed.

And the major theme to come from the session was that we should manage what we are best able to manage - especially in the freshwater, estuarine and coastal zones. In particular, salmon managers should make their main objective to maximise production and output to the marine environment of high quality smolts, with particular attention to growth, survival, migration timing and interaction with other species, both prey and predator.