Theme session N

Population status, life histories, ecology, assessment, and management of diadromous fishes

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Theme purpose

Diadromous species use freshwater environments for reproduction and marine ones as feeding areas or vice versa, or live their entire life cycle in a transition zone between the two. While some diadromous fish species like salmon and eel are globally famous and highly valued, others attract far less attention from policy-makers, scientists or stakeholders but are likely to make crucial contributions to complex marine, transitional and freshwater ecosystems. As migratory fish, these species face environmental and human pressures in a variety of habitats that are often regulated and managed by overlapping local, regional and even international agencies with legislation that differs in scale and purpose.

Many of these species are protected under the Bern Convention, European Habitats Directive, CITES, IUCN and additionally also in national regulations. A number of species are already known to be in great difficulty in most of those countries whose rivers drain into the Atlantic Ocean and its marginal seas. Water quality, migration barriers such as dams, and intense and widespread human alteration of estuaries and rivers are common threats for these species. Across a large scale, climate change can affect migration routes, the extent of estuarine habitat, and the balance between species. However, most of these species are not regularly assessed nationally or internationally (e.g. by ICES) and thus, more information is needed on the current status of diadromous data-limited fish species in the context of international or national classification schemes. The theme session was established by WGDAM (ICES Working Group for Data Limited Anadromous and Migratory Species), a sub-group of WGRECORDS (Working Group on the Science Requirements to Support Conservation, Restoration and Management of Diadromous Species).

Scientific contributions

During the theme session 16 oral and eight poster presentations were given focusing on these issues, covering in total nine species. In the theme session call-out 21 species were listed, with option to other species. The relatively narrow species composition in session might indicate the focus of the research to economically relevant or highly appreciated species. Many diadromous species are data limited, most often due to small economic or social importance. Thus the research focus is not often set on these species, although the species may have a significant ecological function.

The overall attendance to the theme was good, with an estimated 40 participants in the first half and 50 in the latter. The schedule for presentations was tight, and of an allocated 12 minutes for oral presentations and 3 minutes for posters (including questions and discussion) nearly all presenters used up their time slot for presentation. Thus, adequate time was not available for discussion after presentations or at the end of the theme session. The three minutes for posters, although perhaps a bit unusual, helped engage poster presenters in the session and broadened the scope of the session. Of note, one poster “presenter” focused on “the story behind their poster” which was an excellent use of their three minutes, especially as most attendees had had time to view the poster at the previous night’s poster session.

Of a wide variety of species, the European and American eels were most popular study target in theme with eight presentations or posters. Other theme presentations covered species specific studies, multispecies approaches, effect environmental factors, methods for habitat restoration and growth analyses.

The eel presentations covered themes from responses to environmental factors, behavior as adult and in juvenile phases to fisheries and contaminants. In the theme session we heard that adult eels in marine habitats may use a relatively small habitat area (CM N:291), which was identified with acoustic tags. Eels may also have relatively high concentrations of organic contaminants, e.g. dioxin-like polychlorinated biphenyls (CM N:552), that eels can pass on to their eggs at their Sargasso Sea spawning grounds. Thus the habitat selection of eels may influence the reproduction possibilities or success of a local population. In regards to eel stocking, more focus should be on the water quality of the location of stocking efforts. The eel migration might be determined by decreasing temperatures, increase in water flow and moon phases. New findings indicate also that eels aggregate when the environmental factors are favourable for outmigration from rivers or lakes to ocean (CM N:291). Having eel researchers from both Europe and North America proved fruitful – for example, audience members from Europe pointed out ways a northern American research could improve their model (CM N:179).

Four presentations focuses on alewife or blueback herring in North America, reflecting the importance of these greatly diminished anadromous fishes. Habitat use (both freshwater and marine) was addressed by three studies (CM N:430, N:518, N:424) , and the modelling work (CM N:544) using EcoSim was used to model ecosystems with or without anadromous alewife or blueback herring, of importance in areas with active restoration activities.

Studies that had multispecies approach described fish biota in the Florida region (CM N:478), individual trajectories of anadromous fish (CM N:165) as well as a particularly interesting presentation on the role of anadromous fish as forage in marine ecosystem. This kind of presentation is highly appreciated for ecosystem approaches of poorly understood diadromous fish, with science and advisory requirements relating to environmental drivers. Otolith microchemistry is popular method to study the diadromous fish populations in the edge of marine and fresh water. Advanced technology makes also possible to identify different populations and spawning habitats based on trace elements of watershed (CM N:405; CM N:430). The methodology can for example be used to separate different spawning stocks ascending to the spawning area and to support size at age determinations.

In the theme session the importance of ICES working groups was highlighted, including the work of WGRECORDS and WGDAM. The new group working for sea run brown trout, WGTRUTTA, was also introduced to audience (CM N:259). Highlighting the working groups proved to be fruitful: WGDAM picked up several potential new members, and members of WGTRUTTA connected with the authors of a theme session poster focusing on producing a Bayesian stock assessment tool for sea run brown trout (CM N:397) that may be of great help to the working group.

One aspect in theme session was that the reproduction possibilities of some of diadromous species might be restored if environmental degradation has ceased and water quality is returning to the prevailing level (CM N:459). Diadromous species, like the spawning stock of smelt, can be used to indicate the ecological status of rivers (CM N:245). In many areas, both in North America as well in Europe the actions that have been done to improve the state of watersheds, rivers and coastal areas have been successful since 1970s. Although stressors like various human impact to water quality are still remarkable, in several locations the improved underwater nature can be seen. In waters where dams for water level regulation or power

production are the main barrier preventing the migration and reproduction it is still possible to enhance the reproduction possibilities if egg development and growth areas for larvae or fry are favorable.

However, for most of the diadromous species the migration barriers, dams are the most concrete reason preventing the ascend to spawning areas or destroying the suitable habitat. In areas, where spawning habitat are still available, focus should be set on the access to spawning areas. Fish passage, both for upstream and downstream migrations, should be designed and assessed for various diadromous species, not only salmon or trout.

Recommendations

The conference gave a unique opportunity to bring together North American and European researchers working on similar species but in very different political and geological settings. Considering the future work in WGDAM, the high attendance of North American researchers was favourable and hopefully leads to new collaboration. It is also obvious that in many areas there are strong needs for the management and conservation of functionally similar species. More cooperative research is needed for diadromous species to cover the evident lack of knowledge. We raise the need for more information on the status, current threats, and restoration possibilities for other more poorly understood diadromous species, as well as examples of new possibilities in management and restoration for viable fisheries. Especially the function of diadromous fish species in ecosystem scale of reproduction and feeding areas should be highlighted in future work. Actions for one species may also support other species or larger scale effects can be achieved taking the requirements of several species in note.