SYNTHESIS OF THE STATUS OF STOCKS AND THE MIGRATORY CIRCULATION OF THE ATLANTIC SALMON (Salmo salar, L.) IN THE RIVERS OF FINISTERE (BRITTANY)

ABSTRACT

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Atlantic Salmon:

The Atlantic salmon is part of the family of the "*salmoniformes*". As a migrating amphihalin, its biological cycle takes place alternatively in rivers where it is born and in the sea where it joins its growing areas. Adult salmons return to the river, and have an upstream migration just before spawning.
The reproductive behaviour of Atlantic salmon has been well documented because of its biological particularities. French stocks of salmon have been decreasing since the 1970s.
Like in the other countries of Southern Europe, catch-statistics in each of the French salmon regions reveal a continuous decline of the species in our rivers.
This decline coincides with a major decrease of salmon survival in the sea, the spoiling of the rivers (e.g. water quality), and excessive fishing compared to the natural capacities of stock renewal.

Currently, French salmon are mainly present in the small rivers of the "*Massif Armoricain*", where salmon populations are still well preserved, compared to other French rivers. In *Finistère*, about twenty rivers are populated by Atlantic salmon. These are called "migratory rivers".

Purpose of the study:

Many actions in favour of Atlantic salmon have been carried out over the past ten last years, covering the two programmes "*Etat-Région*" 1994-1999 and 2000-2006.

The purpose of this study was first to draw up an evaluation of salmon stocks in the rivers of *Finistère* using the existing data, and secondly to study salmon migration in rivers which are listed for migrating fish (*article L.432-6 article of the Code of the Environment*).

In *Finistère* seven rivers and their tributaries (*river Odet*, *Aulne*, *Elorn*, *Douron*, *Ellé*, *Goyen* and *Aven*), have been studied more than others, and are well documented. Data have been synthesized, and we have a good idea of Atlantic salmon status.

Tools of follow-up and knowledge:

The tools of knowledge and follow-up used on the rivers of *Finistère* were the following:

- An estimation of the potential production carried out either through cartographies of the salmonid habitats, or by means of an estimation by linear regression starting from the surface of catchment area;
- The counting of the number of adult returns (in one of the seven catchment areas only) by trapping and video counting;
- The checking of rod catches (anglers) carried out by the "*Conseil Supérieur de la Pêche*";
- The counting of the number of spawning areas in the river. (with the advantage that it does not require another follow-up on a catchment area);
- The study of the natural production of young salmon carried out by the means of electric fishing following a specific methodology.

These data represent reliable indicators of the state of natural production of young salmon.

The seven catchment areas studied:

The data concerning Atlantic salmon in the seven rivers studied revealed the following:

- In the *Aulne* river: an important deficit of production of young salmon compared to the existing surfaces of potential production,
- A good production of young salmon in the rivers *Odet* and *Ellé* and their tributaries, considered the best potential surfaces of production in *Finistère*,
- An moderate to good production in the rivers *Elorn* and *Douron* and their tributaries, with sometimes major interannual variations (river *Douron*),
- A good level of production of young salmon in the rivers *Aven* and *Goyen*, where the level of rod captures is constant. This will have to be confirmed in the years to come.

The others catchment areas:

Others catchment areas (where no specific studies were carried out), rivers can be classified in the following categories:

- those for which there are no data available on the status of the stocks,
- rivers for which the data collected show an interesting potential for salmon,
- small coastal rivers for which the theoretical potential of production is not important.

The status of the salmon migratory circulation:

The study dedicates a significant part to the assessment of migratory circulation on the rivers studied. 446 out of 485 dams present on the “rivers listed under article L.432-6 of the *Code of the Environment*” were studied concerning their passability by Atlantic salmon.

The collection of the data relating to the passability of the dams by salmon was carried out primarily by asking the “*Associations Agréées pour la Pêche et la Protection du Milieu Aquatique*”, the river technicians, the guards of the “*Conseil Supérieur de la Pêche*” but also by visits to the dams. The opinion was established using a grid with six classes ranging from 0 (ruined dams, erased or without impact) to 5 (dams that can not be crossed by salmons).

The results show that:

- Nearly 65% of the weirs (289) do not present any difficulty of crossing by Atlantic salmon;

- Approximately 17% of the dams (77) may impede migration under limiting hydraulics conditions;

- Finally, 18% of the dams are classified as not easily passable or unsurmountable by salmon (classes 3 to 5).

This means a total of 80 dams are either not easily passable (24) or unsurmountable (11).

Discussion:

In the river *Aulne*, specific studies have been carried out on the migration of salmons using radio tracking (CROZE and Al, 1999 and CROZE and Al, 2000).

They showed an important cumulative impact of the 28 dams present on the course channeled downstream. Currently, the management of these dams is under discussion within the "*Schéma Directeur d'Aménagement et de Gestion des Eaux*". One of the objectives is "the re-establishment of the salmon and other upstream migrating fish".
Various proposals have been studied to allow the upstream migration of salmon and other large fish (PORCHER, 2005).

On the six other specifically studied catchment areas, the migratory difficulties due to the poor level of assessed passability, are compensated by the state of the populations in these rivers.

The biological indices, in particular the indices of abundance of young salmon, show that the obstacles are not crippling. The dams have a variable impact on migratory circulation.

On the rivers where no specific studies have been done, there are several categories of river:

- Rivers with major difficulties of migration which oppose the development of adequate salmon populations in relation to the potential of the river,

- Rivers with major difficulties of migration but where the potential for salmon is unimportant or unknown,

- Rivers where dams do not present an important impact on salmon migration.

It would seem desirable to carry out or continue data collection and follow-up:

- in rivers where studies have been carried out: rivers *Odet*, *Aulne*, *Elorn*, *Douron*, *Ellé*, *Goyen* and *Aven*.

- in rivers not yet studied with specific methods like the indices of abundance of young salmon and in which the listed dams do not present a major migratory

obstacle to salmon. The potentially most interesting rivers (theoretical surfaces of habitats, known presence of salmon). would need to be studied with priority

With regard to salmon migration, the problems of reserved flow revealed by this study should be mentioned to administrators and the services in charge of the water police in order to rectify situations which affect the migration of salmon and other large fishes as well as the biological potential of the river.

In order to maximize the biological outcome of the actions of re-establishment of salmon migration, it is important to rank the various actions according to priority by taking into account the potential and the status of the stock.

In that way, we could rank the rivers according to the need to intervene on the dam constructions in the following way:

- rivers with major difficulties of migration which impede the development of salmon populations when compared to the potential of the river, either occasionally or in a cumulative way,

- rivers where the salmon stocks are satisfactory, but where there are dams with a specific impact on the passability,

- rivers with moderate potential but where there are major obstacles.

Conclusion:

This work aims to contribute to the improvement of the ecological state of rivers by the re-establishment or improvement of the ecological continuity recommended in particular by the European Parent directive on Water.

The migratory difficulties encountered on the various rivers by Atlantic salmon were evaluated and interposed. The "black spots" that were identified will allow formulating priorities and proposals for actions within the framework of a future programme.