Coalition Clean Baltic

PROTECTING THE BALTIC SEA ENVIRONMENT - WWW.CCB.SE

MANAGEMENT BRIEFING:
River Lamprey, *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*

River lamprey © Robertas Staponkus

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SUMMARY OF KEY MANAGEMENT MEASURES

The sea lamprey is very rare in the Baltic Sea while the river lamprey is more widespread and has been the subject of both commercial and recreational fisheries. Both species are anadromous. The main threats to these species are associated with activities that impede their progress up rivers to spawning grounds, changes to hydrographic conditions of water courses, and poor water quality, all of which can affect their spawning success.

Two types of management objective are a priority for lamprey. Firstly, preventing the degradation and loss of suitable habitat, and secondly protection and enhancement of existing populations. This requires taking action to restore the ability of rivers to support migration and spawning of lamprey, as well as conservation of the populations in river systems and coastal waters. Practical actions include habitat restoration, removal of physical obstacles to migration, and artificial restocking and reintroduction. Regulating fisheries, and measures that support collaborative initiatives such as river basin management plans are also essential. Better understanding of the biology of the species and its ecological requirements is vital for successful conservation measures.

Whilst both river and sea lamprey will benefit from these measures, the rarity of the sea lamprey in the Baltic Sea is likely to mean that any effects will be hard to detect for this species.

THE SPECIES

The river lamprey *Lampetra fluviatilis* is an anadromous species as it spends its life in both freshwater and the sea. The larvae hatch from eggs laid in rivers and burrow into the sediment. They metamorphose after 3-5 years after which the juveniles migrate downstream to the sea. After 1-2 years the adults migrate back up rivers to spawn and then die. There are two strains of river lamprey, some migrating up rivers in the spring and others in autumn[1].

The sea lamprey *Petromyzon marinus* has a similar life cycle with adults migrating up rivers in the late winter or spring. They prefer gravel bottoms and adjacent clean sandy areas for spawning[2].

During their marine life stage both species parasitize on major Baltic Sea fish species such as cod, herring, flounder and plaice.

River lamprey © Robertas Staponkus

1 Berg, 1948 in Ryszard et al., 2010.
2 Thiel et al., 2009

Distribution in the Baltic Sea

The river lamprey has a range from southern Norway to the western part of the Mediterranean. It is found in coastal waters and rivers in along the European Atlantic coast, the northwestern Mediterranean Sea, the North Sea, and throughout the Baltic Sea[1].

In the Baltic Sea it is present in numerous rivers of Sweden and Finland, in Russian rivers flowing into the Gulf of Finland, Estonia, and in the rivers of Latvia, Lithuania, Poland and Germany[2].

The sea lamprey is very rare in most basins of the Baltic Sea. Catches have occasionally been reported in Estonia, Latvia, Lithuania, Germany, and Poland. In Sweden it occurs along the west coast but is very rare. Spawning has been reported in eight Swedish and five Danish rivers flowing into the Kattegat and Öresund, and in one Swedish river in the Sound[3].

Conservation status

HELCOM has assessed the river lamprey *Lampetra fluviatilis* as being Near Threatened in the Baltic Sea[4].

The river lamprey is on Annex II and V of the EU Habitats Directive. It has been assessed as Vulnerable in Poland, Near Threatened in Finland, and Least Concern in Estonia and Sweden[5].

HELCOM has assessed the sea lamprey *Petromyzon marinus* as being Vulnerable in the Baltic Sea[6].

The sea lamprey is on Annex II and V of the EU Habitats Directive. It is listed in Red Data Book of Lithuania and has been assessed as Vulnerable in Denmark and Near Threatened in Sweden[7].

1 Ryszard et al. 2010
2 *ibid*
3 Thiel et al., 2009; http://www.helcom.fi/Red%20List%20Species%20Information%20Sheet/HELCOM%20Red%20List%20Petromyzon%20marinus.pdf
4 http://www.helcom.fi/Red%20List%20Species%20Information%20Sheet/HELCOM%20Red%20List%20Lampetra%20fluviatilis.pdf
5 HELCOM 2013. Species Information Sheet
6 http://www.helcom.fi/Red%20List%20Species%20Information%20Sheet/HELCOM%20Red%20List%20Petromyzon%20marinus.pdfhttp://www.helcom.fi/Red%20List%20Species%20Information%20Sheet/HELCOM%20Red%20List%20Lampetra%20fluviatilis.pdf
7 HELCOM 2013. Species Information Sheet

PRESSURES AND THREATS

The main pressures and threats to lamprey in the Baltic Sea are from constructions on rivers that block or interfere with their migration, poor water quality, and targeted commercial fisheries.

The construction of hydroelectric power stations on rivers where lamprey migrate to the upper reaches to spawn has been a major threat. Apart from physically blocking migration routes, or creating obstacles which require fish passes, the operation of these stations can result in radical changes in water levels and the water flow of rivers. By changing conditions both upstream and downstream of facilities they can have an impact on spawning sites and spawning behaviour[1]. The construction of weirs and dams to regulate river flow also present obstacles to the migration of lamprey as well as causing sediment to build up, water temperature rises, and reduced oxygen levels where water has pooled. Dredging riverbeds can lead to erosion and increase turbidity and sedimentation, degrading spawning grounds, and there can also be a direct effect on the larvae which live buried in sediment.

Lamprey larvae require well oxygenated sandy areas of riverbed to thrive, but gravelly riffle areas to secure efficacy of spawning are also key to their success. Poor water quality associated with nutrient enrichment is detrimental to both adult and juvenile stages, and persistent organic pollutions in water courses and the riverbed are known to bioaccumulate in lamprey larvae[2].

The river lamprey has been the target of both commercial and recreational fisheries. Landings records reveal highest catch numbers from the southern Baltic in late 19th century as well as a brief period of increased catches in the 1970's[3]. There has never been a commercial fishery in the Baltic Sea for sea lamprey although individuals may have been caught in both commercial and recreation fisheries for river lamprey. River lamprey fisheries operate in Finland, Russia, Lithuania, Latvia and Estonia using fyke nets, cone traps, baskets attached to weirs, and lamprey trammel nets[4]. The types of fishing gear used depend on local conditions and traditions[5].

The sea lamprey is now very rare in the Baltic Sea. It is larger than the river lamprey, needing bigger hosts. Problems with diminishing fish stocks and sizes may therefore have been a factor in its decline.

1 Birzaks & Abersons, 2011
2 Järv et al., 2017
3 Thiel et al., 2009
4 Thiel et al., 2009
5 Sjöberg, 2013

MANAGEMENT MEASURES

Management measures need to be linked to conservation objectives and to address the main pressures and threats to the species. This will include actions to be taken in the terrestrial environment as the management of river systems, construction works, and eutrophication, are some of the threats to lamprey populations. Although not considered below, monitoring the effects of management measures is also essential to review progress, and to modify actions in light of the findings.

Conservation objectives

Given the decline in the population of lamprey and its disappearance from some river systems around the Baltic Sea, the conservation objectives for lamprey need to focus on maintaining and improving the status of the remaining populations. This is consistent with objectives under the EU Habitats Directive.

Management objectives

Two types of management objective are a priority for lamprey. The first should aim to preventthe degradation and loss of suitable habitat and the second should seek the protection and enhancement of existing populations. This requires taking action to restore the ability of rivers to support the migration and spawning of lamprey, alongside protecting the populations in river systems and coastal waters.

Practical measures

Both river and sea lamprey will benefit from the following measures but the rarity of the sea lamprey in the Baltic Sea is likely to mean that any effects will be hard to detect for this species.

Access to spawning grounds
Obstacles on water courses such as culverts, weirs and dams modify water flows and act as barriers to adults migrating up rivers to spawn. Removing these barriers and/or building natural bypass channels can restore access enabling adult lamprey to reach their spawning grounds. Lamprey may also benefit when similar works are carried out to benefit salmon migration. Fish passes at hydroelectric power stations will be beneficial, but consideration should also be given to modifying existing structures in such facilities to make them more effective, for example by reducing water flow to accommodate the passage of lamprey and reducing the likelihood of juveniles being trapped on turbine cooler screens as lamprey are not effective swimmers. Changing water levels can also desiccate and isolate habitat with ammocoetes especially vulnerable to stranding as they are burrowed into the substrate and may react slowly to changes in water levels. Manually transferring lamprey in such cases can reduce the impact. It should nevertheless be noted that other changes associated with hydroelectrical power stations such as water storage and changes in water flow, may mean that former spawning grounds have changed, making them unsuitable habitat for the lamprey. Improving access to spawning grounds therefore needs to be concurrent with actions to address other issues that have led to the decline of lamprey.

Habitat restoration
Projects such as creating off channel areas with clean water and sediment where fish can rest during migration, and restoration works on spawning grounds and soft sediment areas (ammocoete beds) inhabited by ammocoetes can help to improve damaged or degraded habitat used by lamprey.

Artificial restocking and reintroduction
Restocking of artificially bred lamprey larvae (ammocoetes) has been underway since the 1980s in some Baltic Sea countries. In Latvia, an average of 7.4 million have been released into the lower part of the river Daugava, for example, and in Finland artificial propagation became mandatory for supplementing lamprey stocks since 1997[1]. As pheromones released by juvenile lamprey appear to be an attractant to adults, restocking or reintroduction of lamprey to watercourse can support natural recolonization but this may take decades. The effectiveness of restocking as a restoration measure is difficult to determine as many other factors influence populations levels such as the operation of hydroelectric power stations and changes in the cod stock which affect herring, sprat and smelt, the main food of river lamprey. Any restocking and reintroduction need to be carried out in conjunction with the restoration of migration routes and spawning habitats if these actions are to be of long-term benefit to the population.

Reducing nutrient inputs
Tackling eutrophication is one of four goals of the HELCOM Baltic Sea Action Plan with the first Nutrient Reduction Scheme, promoting a regional approach to achieving this goal, being agreed by HELCOM in 2007. The scheme established Maximum Allowable Inputs and Country-Allocation Reduction Targets compared to a reference period of 1997-2003. Reducing inputs of nitrogen and phosphorus at source is seen as key to achieving good environmental status for the Baltic Sea. Sediment conditions are crucial to the success of ammocoetes which cannot survive in anoxic sediments. Limiting excess algae growth is therefore critical to maintaining a healthy ammocoete populations. Practical actions at a local level, such as reducing the use of nutrients on land adjacent to water courses frequented by lamprey as well as water and sewage management schemes that reduce discharges to rivers and the sea[2] fit within this wider framework.

Regulatory measures

Regulation of fisheries
Licensing, closed areas, effort control and the length of the closed season, are all measures that can be used to regulate the river lamprey fishery to ensure that in areas where there is a fishery, it is operated on a sustainable basis. Technical measures are also needed to support more general regulations and should include setting operational conditions such as the maximum width of fyke nets, and the width of the river that must be left as free flow[3].

1 Greig & Hall, 2011
2 E.g. Parsęta River Basin project. https://baltcf.org/project/increasing-passability-of-ecological-corridors-in-the-parseta-river-basin/
3 Abersons & Birzaks 2014

Supporting measures

River basin management plans

The rivers used by lamprey are likely to extend across several municipalities as well as crossing national borders. A joint integrated approach involving all the relevant parties in agreeing and setting conservation objectives and management plans is therefore essential. River basin management plans provide a framework in which to develop, promote, monitor and report on actions for the conservation of lamprey. They typically set out the objectives, consultation processes, actions, key players, timescales, and organizational structures. They cannot be developed in isolation if they are to be effective and therefore should recognize and advocate measures for the adjacent coastal land, river basins/watershed and the adjacent sea. This is particularly helpful in the case of the lamprey which not only cross from freshwater to the sea, but which are also affected by activities taking place on adjacent land.

Planning frameworks

Planning frameworks can set direction, bring together key players and involve the public in decision making. There is a long history of land use planning in Baltic Sea countries with responsibility typically falling to local and regional authorities. The priorities and detailed provisions in such plans can have a direct impact on habitats used by lamprey, for example by identifying areas for development, methods of construction, and environmental impact assessment requirements. This is even more likely to be the case with some sector specific plans, such as those concerned with energy generation or wastewater treatment, as the decisions set out in the plans can have a significant impact on lamprey habitat as well as on the ability of the species to migrate along watercourses.

Research and understanding

Management measures for the conservation of lamprey need to be underpinned by an understanding of the biology of the species, its ecological requirements and the impacts on both. Ongoing research, for example associated with restocking programmes, tagging studies and habitat restoration initiatives provide valuable information to inform management measures. Some of this is of a general nature, but it is also essential to understand how lamprey are likely to respond at a local level so that appropriate management objectives can be set and effective measures introduced to achieve these objectives.

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