

North Sea Houting (*Coregonus oxyrhynchus*) – Denmark



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|--------------------------------|--|
| Conservation status | IUCN: Global extinct – needs to be updated DK: U2 (+) |
| Protection status | Habitats Directive: Annex II; IV Bern Convention: Annex III |
| EU population (2007-12) | 4,000-6,000 adults |
| MS where increasing | DK |
| Other MS | None |

Photograph © Danish Ministry of the Environment, Hans Ole Hansen and Jan Steinbring Jensen (Jensen, 2013).

Summary

The North Sea Houting was recently considered to be globally extinct, primarily as a result of the loss of nursery habitat and the introduction of obstacles in rivers that prevent its anadromous spawning migration. However, a small population was confirmed as still residing in six Danish rivers. Different measures were taken to reduce mortality, including a full ban on fishing houting and a five-year restocking program. Neither had a lasting positive effect on the populations as they did not address the key pressures. A national action plan was adopted for the species in 2003 and part of its implementation was a significant river restoration project, part-funded by the EU LIFE programme, where physical barriers were removed and areas suitable as houting fry nurseries re-established. The project took place between 2005 and 2012 and involved collaboration between local and regional authorities, land and fish farm owners, the angling society and owners of hydrological installations. As a result of these measures, although the species' overall conservation status remained as unfavourable-bad, Denmark reported an improving trend in its status over 2007-12. It is noted in the relevant Danish plans that the effects of the substantial restoration measures will take time to fully materialise, and that the houting is currently not exploiting the full range of its distribution. The river restoration measures have also had a positive effect on the ecosystem overall, attracting both public attention and new national projects and funding for river restoration projects.

Background

Status and EU occurrence

The North Sea Houting (*Coregonus oxyrhynchus*) is a species of European whitefish in the Salmonidae family. It was once wide-spread across the Wadden Sea along the Dutch, German and Danish coasts. While the large variety of adaptation among whitefish populations makes taxonomy both difficult and controversial, the houting is generally considered a separate species due to its morphological divergence (such as its characteristic 'snout' – see photograph above) and adaptation to oceanic salinity) (Hansen et al., 2008).

Following decades of habitat degradation, loss of river connectivity and pollution the houting population suffered significant declines. It was believed to be extinct in the Netherlands by 1938 and only a small population remaining in Germany with the help of continuous restocking (Jensen, 2013). The houting has been assessed as globally extinct (Kottelat and Freyhof, 2007, Jepsen et al., 2012). However, according to Jensen et al. (2015), this conclusion has been questioned, for instance based on comprehensive genetic evidence identified by (Jacobsen et al., 2012). A small population remained in a few rivers in Denmark, and genetic studies have differentiated these populations from other whitefish (Hansen et al., 1999), confirming in 2008 four major groups corresponding to North Sea Houting (Hansen et al., 2008).

Following the river restoration projects described below, houting and other migratory fish have gained access to another 120 km of river, 20 km of naturally meandering river has been recreated and shallow water lakes created to provide nursery areas for houting fry (LIFE, 2013). As a result of such actions, the Danish Article 17 report for 2007-12 under the Habitats Directive indicated that, whilst the species status remained as unfavourable-bad, its trend was improving (Annex 1), with the population estimated to be 4,000-6,000 adults¹. Notably, however, (Jensen et al., 2015) suggest that the population has continued to decline. The authors cite a field survey done in 2013, where only five North Sea Houting were caught in the River Varde. This was the lowest number caught since the launch of the survey in 1989.

Ecological requirements

The North Sea Houting lives in brackish waters and rivers. It is anadromous, similar to salmon and sea trout, and lives and matures in the open sea and spawns during autumn in larger freshwater courses. Unlike salmon which normally only reproduces once or twice per lifetime, houting can reproduce up to 9 times during its lifetime (Jensen, 2013).

Another distinctive feature is that houting is a poor swimmer, compared to salmon and sea trout – it is unable to pass even small obstacles and fish ladders or steep bypass streams do not seem to work and therefore it requires free and unhindered access to upstream spawning grounds (European Commission, 2015, Jensen, 2013). Further, large areas of reed beds or flooded meadows are essential as nursery areas to allow juveniles to reach sufficient length (6-7 cm) and develop the necessary physiological systems to live their adult life in more saline conditions (European Commission, 2015, Jensen et al., 2015, Sjøgaard et al., 2013).

Houting feeds on zooplankton, supplemented by benthic invertebrates in adults (FishBase, 2017). It requires excellent chemical, physical and biological river conditions and is therefore sensitive to pollution (Jensen, 2013).

Pressures and threats

According to Danish Article 17 reporting data² and published research, the primary pressures on the houting are canalisation, lack of flooded nursery areas along rivers, physical blocking of migration paths and habitat modification and degradation. A lack of flooding is identified as the main threat to the species ('medium importance').

Before the Danish river restoration project took place, other pressures included increased fry mortality at fish farms, local populations not being of viable size, lack of public awareness and houting being caught as bycatch and not surviving discarding (Jensen et al., 2015, Jensen, 2013, Dieperink et al., 1997). More recently, predation from Great Cormorants (*Phalacrocorax carbo*) has been identified as a pressure (Jensen et al., 2017).

Drivers of improvements: actors, actions and their implementation approaches

Organisers, partners, supporters and other stakeholders

Since the late 1980s, several measures have been taken by regional and national governments to save the houting from extinction. An important aspect of the 2005-12 river restoration project was the collaboration between the authorities and other stakeholders, including land- and fish farm owners, the national angling society and owners of hydrological installations (Jensen, 2013). Further, the project made use of citizen knowledge throughout the duration of the project, inducing, for instance, historical pictures of the original river bed and narratives from citizens in public hearings (Giebels et al., 2015).

Contribution/ relevance of strategic plans

The Danish Ministry of Environment and the counties of Ribe and Sønderjylland published a national action plan for the houting in 2003, analysing the possible causes for the decline of the Danish houting population and giving recommendations for necessary conservation measures. It established that, without targeted efforts, none of the local populations except for the one in River Vidaa would be sustained over time (Rydal Jensen et al., 2003). Two years after the plan was adopted, Denmark secured the largest EU LIFE Nature project contribution issued thus far, 'Urgent actions for the endangered Houting *Coregonus oxyrhynchus*' (Annex 2), which included

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<http://art17.eionet.europa.eu/article17/reports2012/species/summary/?period=3&group=Fish&subject=Coregonus+oxyrhynchus®ion=>

² http://cdr.eionet.europa.eu/Converters/run_conversion?file=/dk/eu/art17/envuqtrva/DK_species_reports-131220-95922.xml&conv=354&source=remote#1113ATL

significant river and habitat restorations as part of the implementation of the houting action plan (European Commission, 2015).

The entire Danish part of the Wadden Sea and the lower and middle part of six major river systems leading into the Wadden Sea are protected as Natura 2000 areas. The 2009-15 river basin management plan (RBMP) for the Danish part of the Wadden Sea recognised that parts of the larger watercourses are important spawning grounds for the houting, and that the houting is listed as a priority species in six of the Natura 2000 areas in the region. An explicit objective established in the RBMP is that, in the long term, the Natura 2000-species in and outside the protected areas should reach favourable conservation status (Naturstyrelsen, 2011b).

Measures taken and their effectiveness

The measures taken by Denmark for the conservation of the houting are listed below.

Application of conservation measures for the North Sea Houting in Denmark over 2007-12

| Measure | Type | Ranking | Inside/outside N2k | Broad Evaluation |
|---|--|---------|--------------------|------------------|
| Restoring/improving the hydrological regime | Legal Administrative Contractual | High | Both | Enhance |
| Other species management measures | Legal Administrative Contractual | High | Both | Enhance |
| Legal protection of habitats and species | Legal Administrative Contractual | High | Both | Enhance |

Source: Danish Article 17 report

http://cdr.eionet.europa.eu/Converters/run_conversion?file=/dk/eu/art17/envuqrtva/DK_species_reports-131220-95922.xml&conv=354&source=remote#1113ATL

Before the comprehensive LIFE-funded restoration project, three main conservation measures had been taken:

- The Danish Ministry for Fisheries introduced a complete ban on fishing houting in 1983, both in fresh and marine waters.
- Between 1987 and 1992, a total of 1.7 million juvenile houting were released into six Danish rivers as part of a restocking project. These measures initially resulted in large population increases, but over time the population continued to decline due to continued lack of river connectivity and suitable houting habitat (European Commission, 2015, Jepsen et al., 2012, Naturstyrelsen, 2011a, Jensen, 2013, Søggaard et al., 2013).
- A second set of measures were introduced in 1999, this time addressing houting mortality from fisheries discards. Strict regulations were imposed for the net fishery that frequently caught houting as bycatch (i.e. closed season, closed areas, limited number of nets, etc.) (Jepsen et al., 2012).

The 'houting project', part-funded by the EU LIFE Program as mentioned above, began in 2005 and aimed to restore and maintain favourable conservation status of houting in Denmark and in the EU more widely. The project focused on removing obstacles and creating free passage, re-establishing nursery areas and general river restoration and improvement of physical conditions (Jensen, 2013), carrying out a total of 15 non-recurring management actions (LIFE, 2013). Several hundred trout farms were located along the Danish rivers where houting was found, using weirs to divert water flow and thereby acting as barriers for adult houting migrating upstream. There were also a few small-scale hydro power facilities (Jepsen et al., 2012). The houting project removed eight fish farms, two hydroelectric dams and one former mill pond. The project also recreated over 20 km of naturally meandering river and restored 114 ha of flooded nursery areas for juvenile houting (Jepsen et al., 2012). In total, an additional 120 km of river was made accessible to migratory fish, including stretches that had been restricted for 400 years (European Commission, 2015, Jensen, 2013).

Funding sources (current and long-term) and costs (one-off and ongoing)

The houting LIFE project had a total budget of €13,386,000, of which €8,031,000 was provided from EU funds.

Future actions

No plans for any major future conservation measures related to the houting have been identified. It is emphasised in the 2009-15 Wadden Sea RBMP that the full results of the river restoration measures will only occur after about ten years time (Naturstyrelsen, 2011b).

The management plan (2016-21) for a Natura 2000 area where the houting still exists ('Nørholm Heath, Nørholm Forest and Varde River east of Varde (nr. 88)') requires that improved conditions for the houting are given priority over other types of restoration measures. The plan also mandates the municipality and local land owners to pay particular attention to the houting (Naturstyrelsen, 2016).

Achievements

Impacts on the target species

As the river restoration was gradually finalised, monitoring of the population in 2009 and 2010 showed that the houting had taken advantage of the new opportunities (Jensen, 2013). When the full project and funding came to an end, however, the systematic monitoring ceased, hence there is no full ecological assessment of the overall success of the project. The restoration efforts made available areas along the rivers that had previously been inaccessible to fishing. According to (Giebels et al., 2015), catches of houting in these areas are an indication that the project has been successful.

The Danish Article 17 reporting emphasises that it is difficult to assess the quality of the houting habitat due to lack of good data. The restoration measures have increased the area of potential habitats both for adult and larvae/ juveniles. However, the Danish report estimates that less than 50% of the potential habitat is suitable for spawning, and less than 5% for growth of larvae/juveniles (Søgaard et al., 2013).

Other impacts (e.g. other habitats and species, ecosystem services, economic and social)

The habitat restoration project gained significant public support in Denmark, partly because of its beneficial effects on the wider river ecosystems. For instance, removing obstacles quickly led to Atlantic Salmon (*Salmo salar*) reclaiming habitat (Jepsen et al., 2012). The improved conditions for migrating salmon is also believed to have had a beneficial effect on Freshwater Pearl Mussel (*Margaritifera margaritifera*), as its larvae for periods live as parasites on salmon and trout. In addition, improved water quality as a result of the river habitat restoration is thought to have a positive effect on both the fish species and the Freshwater Pearl Mussel (Naturstyrelsen, 2016).

The houting project is also thought to have encouraged subsequent river restoration efforts by the Danish government (European Commission, 2015).

Conclusions and lessons learnt

The key targeted conservation measures that led to the improvements:

- Removing physical barriers that has increased the area of accessible river habitat.
- Recreating stretches of meandering river morphology and flooded areas, which has improved habitat suitability for the houting.

Conservation measures that have not been sufficiently effective:

- Restocking, which initially resulted in large population increases, but over time the population continued to decline due to continued lack of river connectivity and suitable houting habitat.

Factors that supported the conservation measures:

- Local cooperation between researchers, managers and stakeholders was important, as well as the consensus reached about what the main problems were (Jepsen et al., 2012).
- Efforts were made to communicate the project to locals and anyone interested, e.g. through site visits (Giebels et al., 2015).
- The adaptive capacity of the project management regime itself seemed to have been crucial (Giebels et al., 2015).

Factors that constrained conservation measures:

- Expensive buy-out of fish farms and the breaching of weirs and dams involved both diplomacy and long negotiations and resulted in some delay (Jepsen et al., 2012).
- More interaction with biological experts and the incorporation of lay knowledge could have meant an increase in the soundness of decisions taken (Giebels et al., 2015).
- Monitoring of the houting population was conducted by an experienced expert at the regional level, however, monitoring did not continue post-restoration which has been identified as a limitation of the approach (Giebels et al., 2015).

Quick wins that could be applied elsewhere for the species:

- Complete removal of physical barriers to houting migration.

Examples of good practice, which could be applied to other species:

- Cooperation and dialogue between all relevant stakeholders on the identification of key issues and their most appropriate solutions.
- Extensive communication of restoration efforts to locals and the wider public.
- Complete removal of physical barriers.

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Authorship

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Annex 1. The conservation status of the North Sea Houting at EU and Member State levels

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|------------|-----------|---------|----|---------------------------|-----------|--------------------|-----------|
| Favourable | FV | Unknown | XX | Unfavourable - inadequate | U1 | Unfavourable - bad | U2 |
|------------|-----------|---------|----|---------------------------|-----------|--------------------|-----------|

Qualifier (+) improving (-) deteriorating (=) stable (x) unknown (n/a) not reported

| | 2001-06 | 2007-12 | | | | |
|-------------------------|---------|-----------|------------|---------------------|--------|----------------------|
| | Overall | Range | Population | Habitat for species | Future | Overall (with trend) |
| DE (ATL) | | U2 | U2 | U2 | XX | U2 (x) |
| DK (ATL) | U2 | FV | U2 | U2 | U2 | U2 (+) |
| EU overall (ATL) | U2 | U2 | U2 | U2 | XX | U2 (x) |

Source: Member State Article 17 reports as compiled by ETC-BD on EIONET

<http://art17.eionet.europa.eu/article17/reports2012/species/summary/?period=3&group=Fish&subject=Coregonus+oxyrhynchus®ion=>

Annex 2. LIFE Nature Projects that aimed to help conserve the North Sea Houting in Denmark

| Project Title | Project N° | MS | Type of beneficiary |
|--|-------------------------|----|---------------------|
| Urgent actions for the endangered Houting " <i>Coregonus oxyrhynchus</i> " | LIFE05 NAT/DK/000153 | DK | National authority |

Source: Life Programme database, projects with *Coregonus oxyrhynchus* listed as a key word