



NATIONAL MANAGEMENT PLAN FOR THE HOUTING

APRIL 2003



Ministry of the Environment, Forest and Nature Agency



The County of Ribe



The County of Sønderjylland

NATIONAL MANAGEMENT PLAN
FOR
THE HOUTING



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Preface

In Denmark more than 350 species of plants and animals have disappeared over the last 150 years. In addition there are a large number of species which are rare or endangered.

The fish called the houting definitely belongs amongst the rare species. In addition, it now only lives in the Danish sector of the Wadden Sea area. It has disappeared completely from Germany and the Netherlands as a result of the advance of industrialisation and dike building over the last centuries.

Twenty or so years ago, the houting was very close to extinction. The population of houting was only saved by a quick rescue action – a kind of artificial resuscitation. Since that intervention, the population has again dwindled, and so once again it requires help to survive. If this initiative is to have a lasting effect, it has to address the real problem which the houting faces, the fact that the wide, lower reaches of the watercourses near to the Wadden Sea have become very poor spawning grounds for the fish. It is worthy of note also, that restoring good spawning conditions for the houting will simultaneously improve the conditions for other species of flora and fauna.

Denmark has signed various international agreements which oblige us to protect and support the houting. The convention on biological diversity, as its name suggests, obliges us to contribute to preserving biological diversity, and both the Bern Convention and the EU Habitat Directive impose a concrete responsibility on Denmark to preserve the houting in Europe.

Protecting the houting is a task for society as a whole, and so it is quite natural that the costs of implementing the plan should be covered by the public sector. As already mentioned, there is also an international interest in preserving the houting, and so there is also an opportunity to obtain a significant contribution for the restoration work through the international schemes for nature restoration.

Putting the numerous initiatives into effect will affect a large number of riparian land owners, fish farmers and public authorities etc., and we hope that everyone who will be directly involved in the work as a whole will appreciate the importance of restoring the environment for the houting, and thus contribute positively to the implementation of the plan.



Laurits Tømæs
County Mayor, Ribe



Carl Holst
County Mayor, Sønderjylland



Hans Chr. Schmidt
Minister of the Environment and Energy



Introduction

The houting only lives in the Wadden Sea area, where it feeds, and spawns in the larger watercourses. Once it was common and widespread throughout the entire Wadden Sea region from the Netherlands in the south to Skallingen in the north. Today, natural populations only occur in the watercourses of south-west Jutland, as well as a single German watercourse where the population is maintained by releases. Under these circumstances, the future of the houting is uncertain, but today we know what conditions must exist for the houting to once again become a common fish in the Wadden Sea. The National Forest and Nature Agency and the counties of Ribe and Sønderjylland have designed this management plan in the hope that it can serve as the basis for ensuring a future for the species.

Preserving the houting is not just the responsibility of the people and public authorities in the southern Jutland area. The Danish government has assumed its share of responsibility, and the European Union has added the houting to its list of species which require rigorous protection. The purpose of this is to restore and ensure favourable protection status for species and types of countryside covered by the EU Habitat Directive.

The management plan contains proposals for a range of projects which can solve the problems which prevent the houting from maintaining a population in our watercourses.

It is emphasised that the individual projects will be implemented in close collaboration with the owners of riparian land and fish farms in such a way as to

ensure that no one will be inconvenienced without financial compensation if it is necessary to take measures beyond those covered by applicable legislation

In addition to the houting, there are other rare species in the rivers running into the Wadden Sea, such as salmon, sea lamprey and river lamprey. All of these are on the Danish “red list” of species in acute danger, and on the EU list of species requiring special protection. These species will also benefit considerably from the initiatives which will be put into effect to help the houting.

Creating a more certain future for the houting population is an expensive task for Denmark. Resources need to be allocated over the coming years if we are to improve the conditions for the houting. The survival of the houting is a matter of considerable international interest, and so the EU will naturally be a partner in the project. The EU LIFE fund, which has the goal of granting financial support for the protection of species of flora and fauna included in the EU Habitat Directive, is an obvious place to seek funding for the restoration work.

An assessment of the costs and decision on financing will be conducted for each individual project.

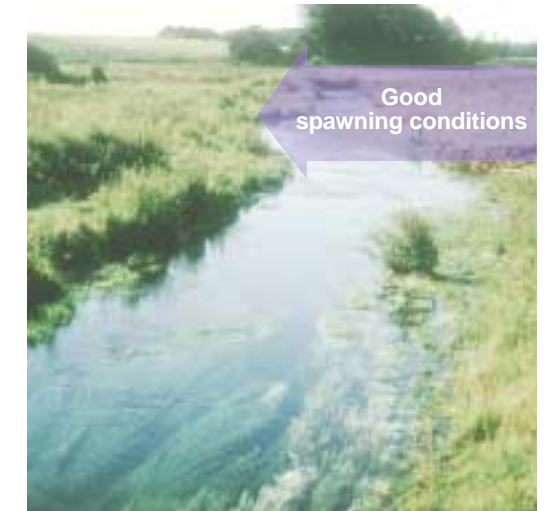
Concrete fall re-built as a passage



Larger watercourse with good water quality



Flooded areas are essential as nursery areas for the houting fry



Gravel on the river bed and evergreen plants ensure good spawnings conditions

National and international protection of the houting

In the winter of 1978-79, the counties of Ribe and Sønderjylland conducted a study of the status of the houting in Denmark. The findings were very discouraging. There was only a very small breeding population in the Vidå river, and a few fish in the Ribe Å river. The entire population in the world was alarmingly small. At this point the houting was threatened with extinction. There was an acute need for protection.

Preservation and international protection

In 1983 the Ministry of Agriculture and Fisheries introduced total preservation of the species in both freshwater and saltwater. The houting has been a protected species ever since.

In 1988 the houting was listed in the Bern Convention. This is an international agreement to protect the wild animals and plants of Europe and their natural habitats.

The houting was designated as a special priority species in the EU Habitat Directive of 1992. This directive includes a list of animal species for which conservation requires rigorous protection and the designation of what are called EU Habitat Areas, which are special conservation areas for the particular species. The whole of the Wadden Sea and the lower reaches of most of the large watercourses in the area have been designated as an EU Habitat Area for the houting. The designation of habitat areas has not yet been completed.



Regulation of the fishery and international protection have together with extensive support work removed the acute danger that the houting will become extinct.



Figure 1. Designated habitat area of the houting.

Denmark and the EU agree that the designation of habitats relating to the houting is not satisfactory, and that there is a need for a review. The Minister of the Environment has decided that the designation of habitats in Sønderjylland should be examined by the newly appointed Lauritsen commission, with a view to providing a concrete proposal.

The houting is included in the most recent red list of endangered plants and animals in Denmark as a rare species. It is also included on the Danish “amber list”, which includes species which are a national responsibility.

Fishery regulation

A study of the fish populations in the Wadden Sea from 1994-96 showed that a large number of houting were caught as a by-catch in fyke nets. Many of the fish did not survive being caught. Anglers also catch houting as a by-catch in the watercourses. They release them, but it is unknown how many actually survive.

Clearly, this large by-catch is not compatible with trying to save the species. Consequently, in 1999, regulations were introduced for fishing in the Wadden Sea and the watercourses which have significantly reduced this by-catch.



Eggs being stripped from a female houting

Box 1

The rescue of the houting

From 1987 to 1992, a rescue operation was launched to assist the population in the Vidå river and to re-establish the populations in the other watercourses running into the Wadden Sea. This intervention included breeding and releasing houting fry into the watercourses where they had previously been widespread. A total of approximately two million fry were released into the 6 largest tributaries of the Wadden Sea. The majority of these were released in the rivers Vidå, Ribe Å and Brede Å, but there were also smaller releases into the Kongeå, Sneum Å and Varde Å. In parallel, a number of restoration projects were conducted, particularly with a view to improving the passages to the spawning areas for the houting.

Releasing houting fry into the lower reaches of the river Ribe Å.



The biology of the houting

The houting is closely related to the common whitefish (*Coregonus whitefishus*) which is found in larger freshwater lakes and brackish waters. The most striking difference between a whitefish and a houting is the pointed “snout” of the houting. The houting also grows longer and heavier than the whitefish, and can tolerate waters with higher concentrations of salt.

This is clearly shown by the different habits and distribution of the two species. The houting moves extensively around the salt waters of the Wadden Sea in search of food, whereas the whitefish mainly stays in freshwater lakes or fjords with low salinity.

The previous and current distribution of the houting

From the 1920’s to the 1950’s the population gradually disappeared from most of the waterways. At the end of the 1970’s, there was a tiny population in the river Vidå and an even tinier population in the Ribe Å river. These were the very last places where houting existed.

In the Netherlands, the houting was a common fish in many of the larger rivers and estuaries until around 1910-1915, when the river mouths began to be diked and regulated with sluices. From this point the yield from fishing fell rapidly. In 1916, 3.3 tons of houting were caught, in 1918, 1.2 tons and in 1928, 115 kg. To compensate for the decline in the population, there were attempts between 1922 and 1939 to release large numbers of houting fry in the rivers Ijssel and Maas, part of the Rhine delta. These releases had no, or else very limited, results. In 1938, the houting was pronounced to be definitively extinct in the Netherlands.

In Germany there used to be houting populations in all the large rivers flowing into the Wadden Sea. A hundred

years ago, around 30 tons of houting were caught annually in the Rhine, the Elbe, the Weser and the Eider. The populations have slowly been disappearing as a result of pollution and the building of sluices and weirs. Since the end of the 1980’s, there has been an attempt in Germany to re-establish the populations of houting, especially in the river Treene, which is a tributary of the Eider. The status of this project in 1999 was that enough houting could be re-caught to sustain a release programme involving between 100,000 and 200,000 young fish per year. In their status report regarding houting, *Landes-amt für den Nationalpark Schleswig-Holsteinisches Wattenmeer* concluded that in 1999 it was not possible to successfully establish a self-reproducing population in the Treene or other German watercourses.

The houting spawns in the watercourses

The houting lives and matures in the Wadden Sea, but in the autumn it ascends the larger watercourses to spawn. Only those which allow free passage can be used for spawning. Even small falls and dams can effectively block the passage of the houting to the spawning grounds, and it will not use fish ladders. The only form of fish passage which the houting can certainly clear are sweeps with large flows.

The houting spawns in the lower and central parts of the watercourses where the bed is at least 5-6 metres wide. The mature houting looks for reaches with a good current, a firm bed and evergreen aquatic plants. The spawning period is relatively short. In Denmark it lasts for only 2-3 weeks around November to December. As a comparison, the whitefish spawns over a longer period around the turn of the year.

Figure 2. The previous and current distribution of the houting.



The houting spawns its eggs freely into the water. The adhesive eggs attach themselves to aquatic plants, stones or gravel. A single female houting has 20-30,000 eggs per kilo of its body weight, whereas, by comparison, a sea trout has 2-3,000.

The male houting matures sexually faster than the female. Thus some male fish are sexually mature when two years old, while most do not spawn until they are three years old. The female fish, however, do not mature until they are four years old, with some exceptions which spawn at three years old.

The distribution of the sexes for mature fish in the spawning grounds is very uneven. Normally there are considerably more males than females. There are two reasons for this imbalance. One is the fact that the males mature a year earlier than the females, another is that the males spend longer at the spawning grounds.

Migration back to the Wadden Sea

Once they have finished spawning, from early spring

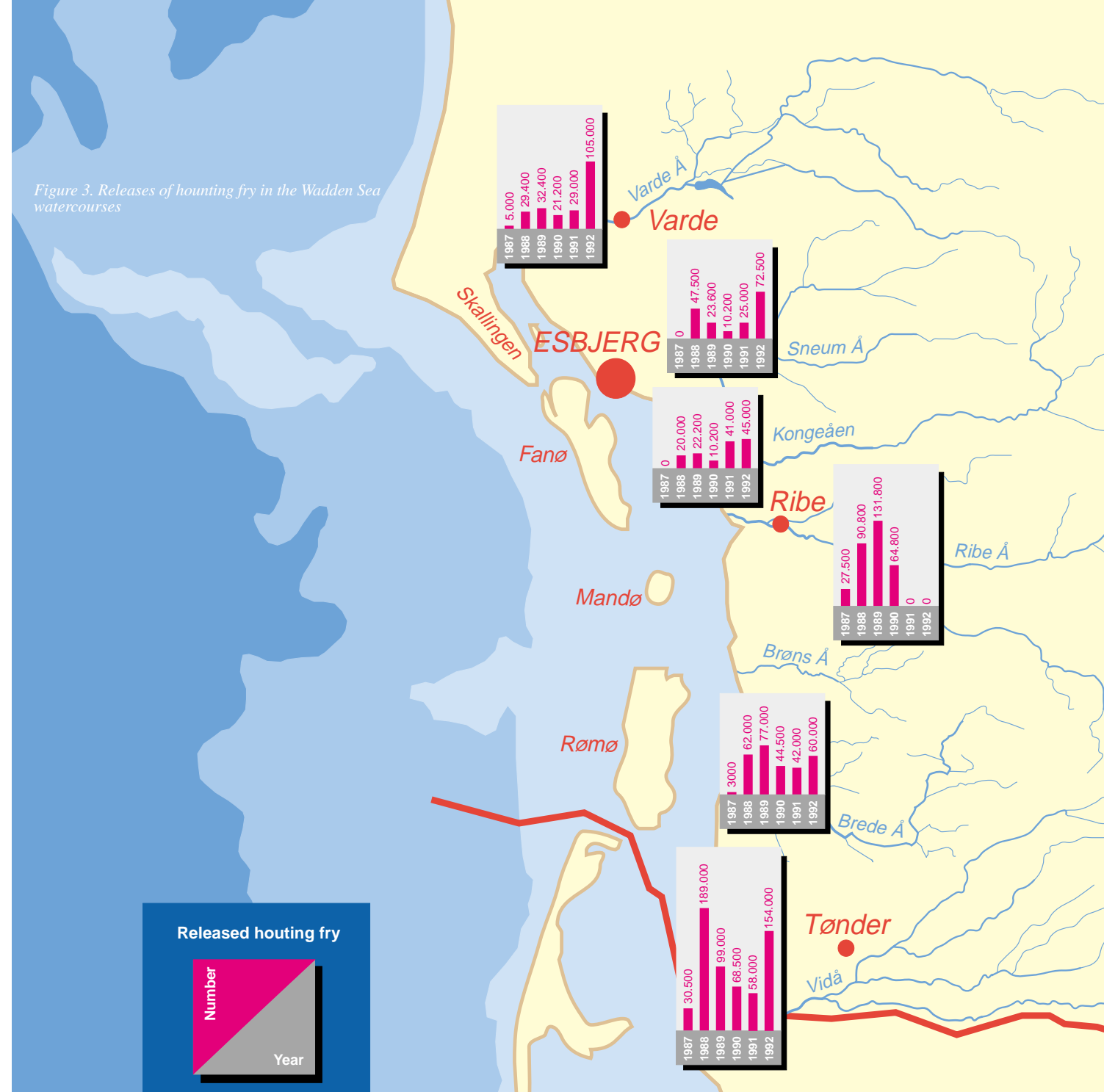
until May, the fish migrate down into the lower reaches of the watercourses and return to the Wadden Sea. This migration is probably determined by a rise in the temperature of the water.

The studies conducted by the counties of Ribe and Sønderjylland have also shown that some of the immature houting over-winter in the lower sections of the water systems, as has been observed for sea trout, for example.

The adaptation of the fry to the Wadden Sea

The houting succeeds in producing fry in some watercourses, but not in others. The environment required by the fry to reach the Wadden Sea once they have hatched is not as well known as, for example, for the sea trout and salmon. It does seem, however, that it is at this stage of the life-cycle of the fish where the most important causes of the decline of the houting are to be found, and so also the chance to reverse this trend.

The houting grows to a length of 45-60 cm. The photograph shows a mature female (above) and a mature male.



We know for certain that the houting eggs hatch in February – March, and the newly-hatched fry are approximately 10 mm long. Studies have shown that the newly hatched fry cannot survive a level of salinity such as that found in the Wadden Sea. When the fish reaches a length of 30-40 mm, its physiology changes so it can withstand the move from freshwater to saltwater. It is therefore probable that the survival of the houting depends on leading the newly hatched fry to areas with static water, such as flooded meadows, smaller lakes,

large river bends and similar areas which constitute the natural rearing grounds. The fry live for the first spring months on zooplankton, which exists in abundance in such areas. Whether the small houting swim deliberately out to the Wadden Sea, like sea trout and salmon, or whether they are just passively carried out on the current, is not known. It is probable that the fry reach the Wadden Sea in April to May, as by now they have achieved a length of 30-40 mm.

Box 2

The genealogy of the houting

The houting (Coregonus oxyrhynchus) is a salmonoid, and belongs to the whitefish family. Studies conducted on Danish houting and whitefish show that the genetic difference is very small, whereas whitefish from the Baltic Sea show significant differences from the Danish whitefish and houting. The small genetic differences between North Sea houting and whitefish probably mean that the houting and whitefish diverged from one another relatively recently in evolutionary terms, i.e. within the last 10,000 years. It is probable that the Danish houting and whitefish migrated into the area after the last Ice Age via the river system of the Elbe, as it then existed.

The fact that the houting lives in both freshwater and saltwater has led to some fairly important adaptations which the whitefish does not display, such as tolerance to high levels of salinity and a different diet. Thus from the point of view of population genetics and evolution, it is very important to preserve the houting.

As well as our houting, there are other populations of fish which resemble houting in Europe, including species in the Baltic Sea and purely freshwater populations in the large lakes of central Europe. Fish resembling the houting are also found in Canada and Russia. The other houting species are all different to the one we know in the Wadden Sea. Our houting are distinctive because they migrate, spawn in watercourses and mature in the Wadden Sea, which has a high level of salinity (33 promille).

Status of the houting populations

From 1987 to 1992, the counties of Ribe and Sønderjylland released a large number of fry into the watercourses. Two or three years later, the first mature houting were recorded in the watercourses. In the subsequent years large populations were established. Thus the largest populations occurred in 1992-94, the total population was between 75,000 and 100,000 spawners.

The development of the populations

Since the end of the 1980's, the counties have followed the development of the populations in the watercourses. Every year censuses are taken at selected stretches using electro-fishing. In several of the watercourses, these are supplemented with studies which enable the calculation of the size of the populations from year to year. These studies show that there is a big difference in how well the houting can manage in the various watercourses.

The houting cannot negotiate even small obstacles and will not use fish ladders. This means the fish often cannot reach large stretches of the watercourses because of impassable obstacles.

In the rivers Brøns Å and Rejsby Å, individual occurrences of houting have been recorded, even though there have been no releases into these two watercourses. It is most likely that the fish recorded here have come from other water systems, but it is not known whether there is a small amount of reproduction in these watercourses. The overall population of spawners in Brøns Å and Rejsby Å is estimated to be not in excess of 50 (1995).

In Sneum Å and Kongeå, the releases led to the formation of large populations in the course of a few years. This level fell drastically a few years after the releases were discontinued. The latest studies, in 2000, showed only a few fish in these two watercourses.

The releases in Varde Å, Ribe Å and Brede Å also rapidly resulted in large populations. However, these also began to fall just a few years after the releases were discontinued. Censuses have been taken in Ribe Å and Varde Å since 1994. In recent years the spawning population in Ribe Å has been between 1000 and 1500, whereas in Varde Å and Brede Å the figure is 600-800 for each. It is still uncertain as to whether the populations can be maintained in these watercourses.

Vidå is the only watercourse where releases have led to a large production of young fish. In the years since the releases were discontinued, the population in the Vidå has remained fairly stable. This could be interpreted as meaning that the conditions for reproduction in the Vidå are better than those in the other watercourses, and this is supported by the fact that before the assistance measures were taken at the end of the 1980's, the Vidå was the only watercourse where there was a definite population.

In 2000, the population in the Vidå was estimated at approximately 4000 spawners. Taken as a whole, the entire population of houting in Denmark was estimated to be between 6000-7000 spawners.

The distribution of houting in the watercourses

In the Varde Å river, the dams for fish farming and that linked to the Karlsgårdeværket have cut off the houting from spawning grounds in sections of the old Varde Å and the tributaries Alslev Å, Grindsted Å, Ansager Å and Holme Å.

In Sneum Å the houting are cut off from the spawning areas above the fish farm at Endrup Mølle. The largest tributary Bramming/Holsted Å is completely blocked off by the weir at Bramming Fiskeri.

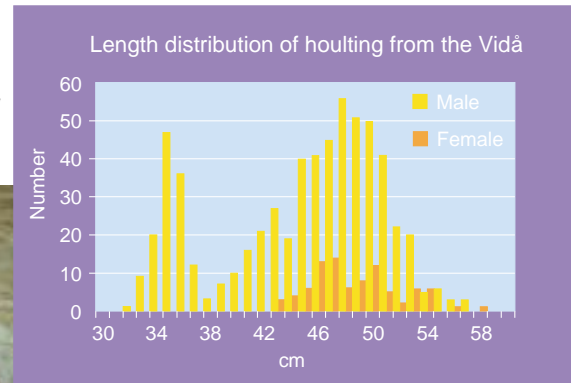
There are several dams in the Kongeå. At the first dam, a by-pass channel has been established, giving houting access around the fish farm at Jedsted Mølle. The next obstacle is about 20 km further upstream, where the weir at Nielsby Fish Farm prevents them from ascending any further up the Kongeå.

In the Ribe Å they can only reach as far as the dams in the city of Ribe itself. However, there are good spawning conditions in the Hjortvad Å tributary, where the houting have unimpeded access to the entire watercourse. The fish spawn in an approximately 10-12 km long stretch from Kalvslund to Ribe.

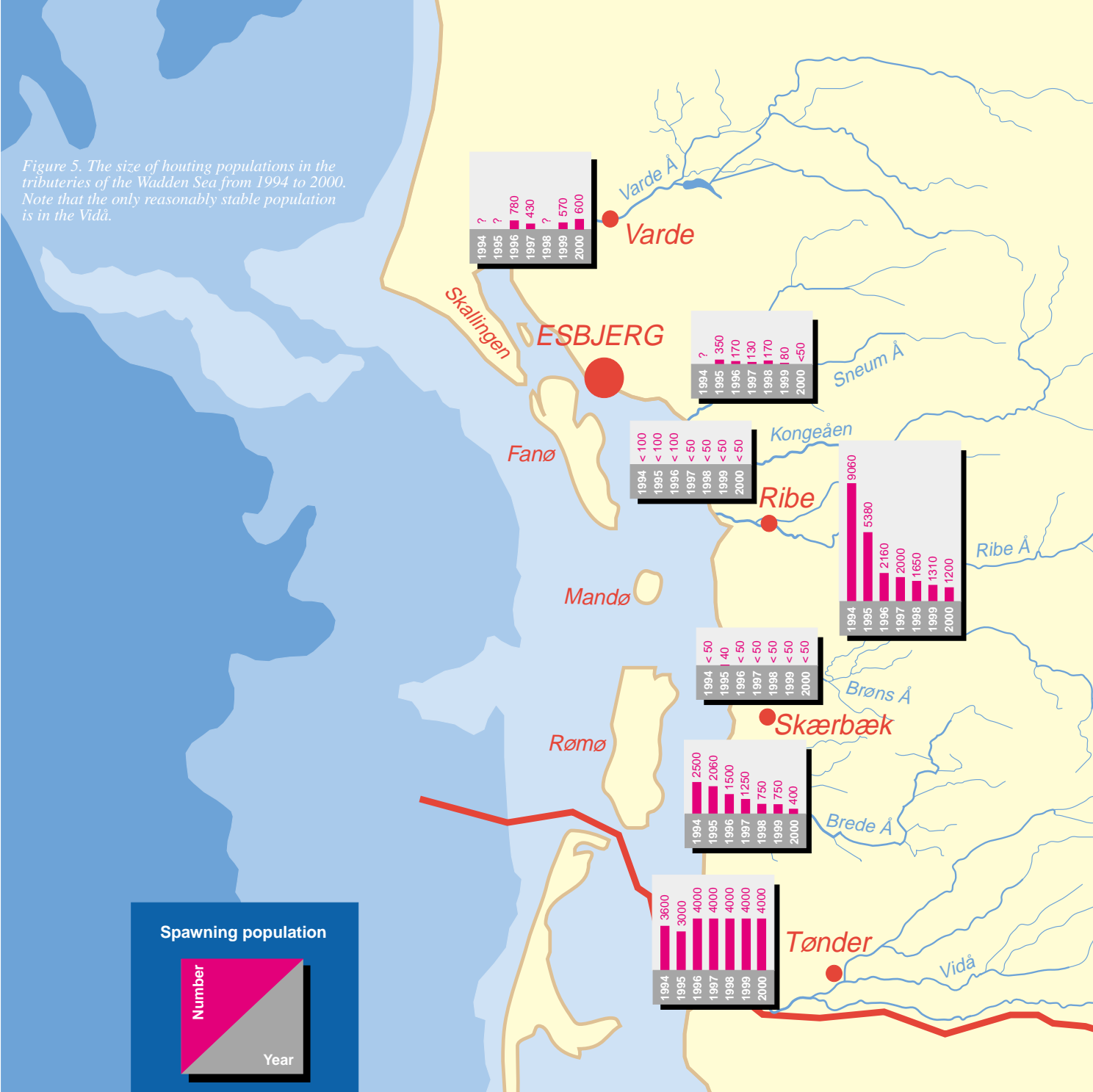
The best passage conditions are found in the Brede Å. Here the houting have free access to the whole river system, as all obstacles and dams have been removed.

The Vidå offers reasonably good passage conditions to a large part of the system. However, the Arnå in the northern branch of the Vidå system is blocked off to houting by a large dam in the town of Tønder. In the Grønå free passage has been created, although there are still obstacles in the Sønderå at the Rens fish farm.

Figure 4. Size distribution of the houting population linked to the vidå. The dominant size is 40-50 cm. The relatively large group of fish between 32 and 38 cm long. (one-year old fish) shows there is good natural reproduction.



Electro-fishing for houting below the sluice in Ribe

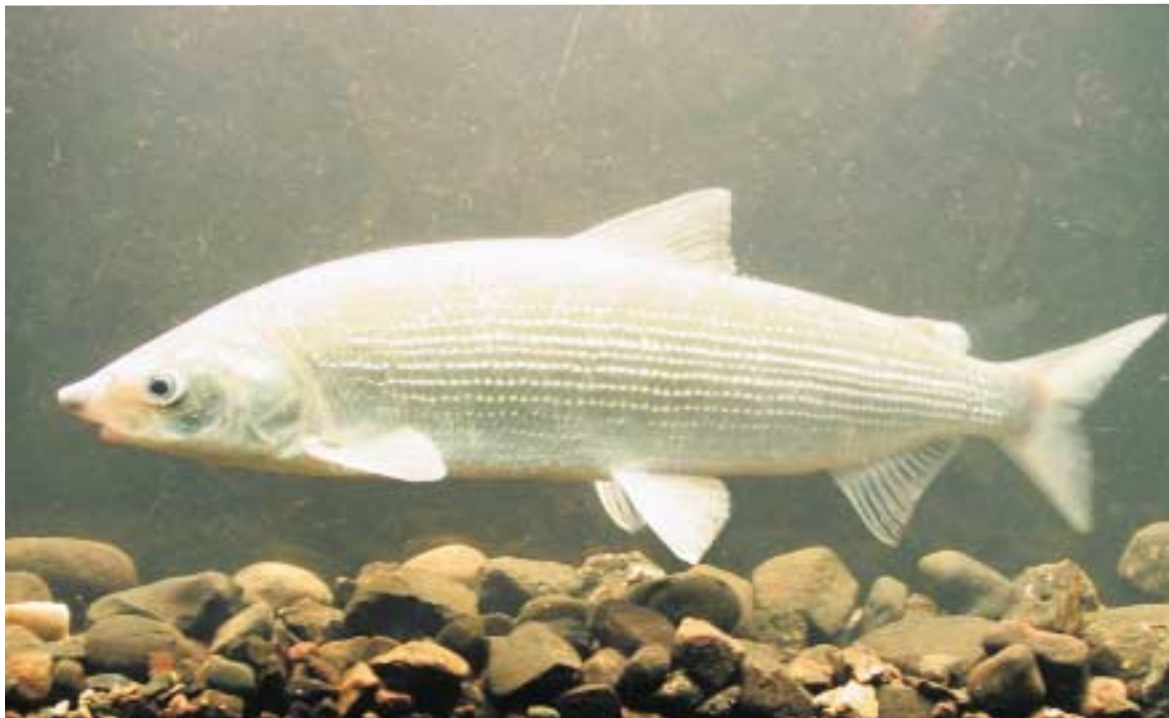


Calculation of the houting populations using the capture-recapture method

Calculating the annual ascent (spawning population) in each watercourse is a complicated matter. It cannot be done just by catching fish and counting them, as it is completely impossible to catch more than a fraction of the population. If, however, the size of this fraction can be established, then it is possible to calculate the number of fish not caught and so the total size of the population. This is called the "capture-recapture" method.

In November-December, houting are electro-fished in the spawning grounds in the watercourses. As many as possible are caught and tagged so that they can be recognised later. Once tagged, the fish are immediately released. The next spring, the houting are fished for again. This time nets and stake nets are used in the lower reaches near the Wadden Sea. On the basis of the relationship between the number of tagged fish (those which had been caught in the autumn) and untagged fish (those spawners not caught in the autumn), the total population can be calculated.

Box 3



Reasons for the decline of the houting

In the middle ages, the first water mills were constructed. The setting up of these mills and related damming must have already at that time created problems of passage for the fauna in the watercourses.

The decline of the houting must be seen in the light of the radical changes in the environment and the landscape which have been carried out in the last hundred years. The mark we have left on the landscape in the thousands of years following the last Ice Age are insignificant compared to what we have done the last hundred years.

Efficient mechanical power was developed during the industrialisation era of the 1800's. Thus it became possible to build embankments around the marshes and large dam constructions, to straighten and dredge the watercourses, and to drain the marshes and meadows to allow the cultivation of what was previously wetland. Sanitation problems were rising out of control in the growing urban settlements. These were solved by building sewers which discharged untreated wastewater directly into the watercourses and the Wadden Sea.

Embankment of the marshland and watercourses

The extensive marshlands which were submerged long into the spring were probably the nursery for the houting. There was an abundance of microscopic animals on which the fry could feed. The fry could grow here in the fresh or brackish water until the spring, when they were big enough to be able to tolerate the very saline water of the Wadden Sea. The inhabitants of the marshes regularly had to contend with floods of fresh water

from the watercourses, and at times the sea breached the dikes and flooded the marshland. It is very easy to see why the inhabitants wanted to tame the life-threatening sea and also create better conditions so that they could exploit the luxuriant grasslands. From the start of the 20th century many embankment projects were implemented, and in the 1920's, once Sønderjylland became Danish again, there were some very ambitious reclamation projects in the Danish marshes.

This embanking of the marshes had serious consequences for the houting. The fry and young fish could no longer grow in the wide flooded areas. The transition from fresh to saltwater requires considerable physiological adaptation by the young houting. They are only able to do so once they have reached a certain size and physiological maturity.

Cut off from the large flooded marshlands, the decline of the population of houting was inevitable. The dependence of the houting fry on shallow lakes or large flood plains could well explain why there is still a small population in the Vidå. With Rudbøl Lake and the polder of Magisterkogen, Vidå has expanses of water where the houting can grow to the size necessary for migration to the Wadden Sea.

If the natural population of the houting is to be restored, then it is certainly essential to create more natural drainage conditions in the lower sections of the watercourses.

The houting spawns in watercourses with a fresh current and gravel bed or aquatic plants

In this regard, it is important to create shallow areas of static water big enough to allow a large number of houting fry to grow to the necessary size.

Even the smallest obstacles are a total barrier to houting



Damming the watercourses

There are several reasons why the watercourses have been dammed at various times. As early as the middle ages, water mills were built and they required dams. In the last centuries, it became quite normal to build

irrigation systems. This was done by building an embankment or damming the watercourse. This allowed the water to be led into canals and out onto the meadows, and thus fertilised, as the water was rich in nutrients. Once artificial fertilisers were developed, this type of irrigation became unnecessary. Many of the irrigation systems fell into a state of disrepair, but, especially after the end of the Second World War, the dams found a new usage: for fish farming.

The dams at fish farms often create major problems for the houting and the other fauna in the watercourses. The damming also means that large numbers of micro-organisms, infant houting fry, young salmon and trout are carried by the current into the fish farms, where they end up as food for the farmed trout. Studies show that many fry perish this way.

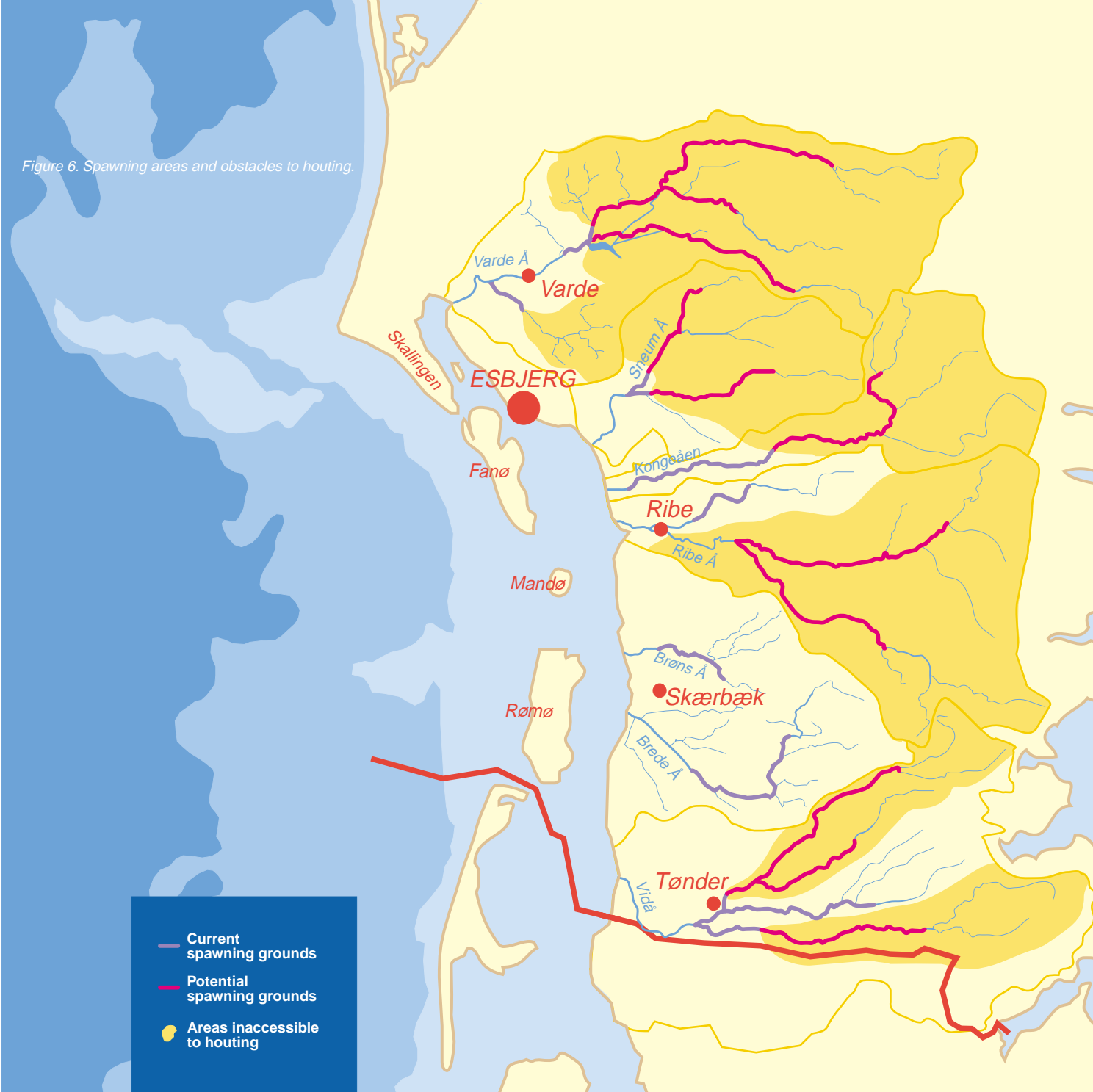
In 2005, the rights of the fish farmers to use surface water expire. At this point it will be possible to introduce changes which will restrict these problems in the future.

Straightening of the watercourses

The houting release their small, adhesive eggs directly into the water. The eggs attach to the aquatic plants, gravel and stone. In the anchored egg, the fry grow to hatching size.

It is therefore of great importance to the houting that the watercourses contain a large number of aquatic plants in the winter and that there are areas of stone or gravel on parts of the river bed.

Figure 6. Spawning areas and obstacles to houting.



Nearly all watercourses in Denmark have been straightened. This is equally true of those in the marshes. The term “straightening” disguises the fact that the process involves deepening, widening and straightening so that the watercourses resemble canals, so that run-off does not lead to flooding. The valleys could then be cultivated. One of the results of the straightening is that the run-off becomes more irregular. This in turn means that large amounts of earth and sand are eroded



Straightened watercourse with embankments, which effectively stop flooding

from the banks and carried by the current to calmer spots where they settle. These unstable beds and banks impair the living conditions for the plants and animals in the watercourses. Micro-organisms, which the fish eat, cannot survive in the drifting sand, and so the food supply for the fish is reduced.

Also, stone and gravel is covered by sand, and the adhesive houting eggs have nothing left to stick to. The worst effects of straightening of the watercourses can be made good again by altering the watercourses to once again allow the flooding of the meadows in the winter. In addition to recreating areas of countryside, restoration ensures the conversion of excess nitrogen from the land and the town.

Dredging the watercourses

Houting need a varied environment in the watercourses. There must be green aquatic plants in the winter, and areas where the bed is stone or gravel, to which the adhesive eggs can attach. Maintaining the capacity of the watercourses to move the surplus water from rain or other precipitations to the sea is known as dredging. These days this maintenance has to be carried out with sensitivity. Only sand or mud which builds up in the watercourses may be removed, not gravel and stone. Plants and weeds may be removed from the watercourses to facilitate the irrigation of adjacent areas. In the past, digging up and cutting weeds was carried out rather severely. It is therefore now quite normal that even in the large watercourses there is an absence of stone, gravel and plants. When plants are cut back harshly, the effect is that other species take over, and this favours those that die back in winter. Without stone, gravel or evergreen plants, the houting eggs have nowhere to adhere. This is one of the most critical problems for the houting, and the solution would appear simple: just replace the gravel and stone and limit the weed-cutting. However, the watercourses still need to be able to carry water away so that the fields can be cultivated. This means there is not a great deal of room to act. Under any circumstances, the maintenance has

to be taken into account if the population of the houting is to be improved.

Pollution of the watercourses

The houting requires good water quality, with sufficient oxygen for the eggs to develop. Environmentally harmful, toxic substances can prevent the eggs hatching, and so must be excluded.

are currently working to reduce this pollution from outlying rural dwellings.

The construction of treatment plants is now so well under way, that wastewater pollution in the larger marsh watercourses is no longer a significant problem for the houting.



The drain has washed the bank away

The establishment of water treatment plants in the 1980's and 1990's has gone a long way to remove the pollution from sewerage in built-up areas. However, there are still problems with the discharge of wastewater from scattered dwellings in the countryside. Legislation to solve these problems is in place, and all municipalities



Sand migration in a small watercourse because of heavy-handed maintenance



Seepage of ochre into the watercourses

The discharge of organic material from fish farms, in the form of excrement and food remains is damaging to the watercourses. The production conditions at fish farms have been set into a fixed framework thanks to legislation at the end of the 1980's. The results of county inspections, however, show that there are still problems related to fish farming. They show signs such as those related to poor oxygenation in the watercourses downstream of some fish farms. Often oxygenation is so poor it seriously impairs the animal life.

A number of ancillary materials are used in fish farming, such as copper compounds, disinfectants and antibiotics. The use of these materials is limited in the countryside by legislation, and when they are used it must be in accordance with a fixed framework laid down in a ministerial order from the Ministry of the Environment. In the next few years, all fish farms will legally have to have environmental approvals, and there is an important job to be done in ensuring that fish farms are operated in a way which allows the watercourses affected to contain diverse flora and fauna.

Ochre pollution

Ochre is poisonous to aquatic animals. In regard to fish, the eggs and fry are especially vulnerable to occurrences of ochre. Ochre consists of various ferrous compounds which are often released when the soil of West Jutland is drained or the watercourses are straightened. The bright red colour of many of the watercourses in West Jutland is evidence that the problem of ochre continues.



Houting caught in a net Figure 7. Example of a good and a bad watercourse for houting.



Work has been in hand for many years to solve the problem of ochre. This has mainly taken the form of trying to raise the level of groundwater to where it was before all the straightening and draining was carried out. Once the water table is raised, the ochre will stop being released from the soil. If the water table cannot be raised because of drainage, shallow lakes with abundant plant life where the ochre can precipitate can be created in the watercourses. The battle against ochre has to be continued, not just for the sake of the houting, but for all the other fauna in the watercourses.

Fishery

In the past, fishing was an important element in the livelihood of the inhabitants of the marshes. Before the drainage at the beginning of the 20th century, fishing on the marshes followed the ancient traditions. Over a period of time, both the fishing boats and the tackle had been developed and adapted to suit the special conditions which existed in the marsh, and only people brought up in these traditions fished there. We have no accounts to show how important houting fishing was in Denmark. In all probability the main catch was eel. However, the houting was very important in the Netherlands and Germany, where the commercial fishery carried on until around 1920, when the houting slowly started to disappear.

Today, fishing in the Wadden Sea and the watercourses is mainly recreational, and carried out by hobby fishermen and anglers using modern equipment. A large scale investigation of the fishery in the Wadden Sea in the mid 1990's showed that each year between 15% and 20% of the total population of houting was caught in fyke nets or on the hooks of anglers.

This study led to a change of the fishing regulations in the Wadden Sea area, so that today fewer houting end up in nets than in the middle of the 1990's. Fyke net fishing is done in a special way in the Wadden Sea, with most of the fyke nets being set up by the high-water line, so the nets are dry at low tide. This means that houting and the rest of the by-catch cannot normally be put back alive.

Despite the protection of the houting and the other fishing regulations in the Wadden Sea area, fishing will continue to cause the deaths of a significant number of houting.



Future initiatives

The releases of fry at the end of the 1980's and the start of the 1990's resulted in large populations of spawning fish in all the larger watercourses of the Wadden Sea just a few years later. In Sneum Å and Kongeå these populations have now completely disappeared. The main reasons are probably dams for fish farming which cut the houting off from suitable spawning and nursery areas in the watercourses. In Brede Å, Varde Å and Ribe Å there are still populations of spawning fish, but these are becoming smaller each year. Under existing conditions, it is doubtful as to whether these populations can be maintained in the longer term. Today, only the Vidå supports a reasonably stable population.

It is therefore essential to solve a number of environmental problems today which limit the living conditions of the houting, if we are to preserve it in its natural area of distribution. The biggest problems are the lack of access to the spawning areas, and poor survival rates of fry because of the lack of nursery areas. There are other environmental conditions in the watercourses which have to be improved if the population is to become sizeable again.

The houting is considered an endangered species at a European level and is thus included in the EU Habitat Directive. The EU has also set aside resources to protect and improve the conditions for the species included in this directive. An application to the EU LIFE Fund for resources could very well be a good way to cover some of the costs of this assistance work through co-financing. The most rational division of work between the counties, the government and the EU would be that the counties take care of the planning in collaboration with the Danish Forest and Nature Agency and the Directorate

for Fisheries. To achieve the best possible benefit from the restoration work, it should be organised so that the most effective measures are taken first, in other words, the highest number of houting possible for the least money. The initiative must also be prioritised so that it conforms to the policies of the counties of Ribe and Sønderjylland regarding nature restoration and other conditions in the Wadden Sea region.

It is important from the very start to talk to the fish farmers and other riparian owners involved, as the project is intended to be implemented in collaboration and by agreement with every individual affected. Everyone who suffers a loss or inconvenience in production as a result of the restoration work must be awarded suitable financial compensation in accordance with the applicable legislation.

Compensation can be given for changes in forms of production, but also for relinquishing rights or as subsidies for, for example, developing a more "houting-friendly" method of fish farming. It is important that the citizens do not feel that new regulations are being imposed upon them which make their lives more difficult without their receiving any compensation. The citizens are important and essential participants in the work of protecting this rare species of fish for posterity.

What can be done to help the houting?

In 2005, the permission for fish farmers to use water from the watercourses will expire, and an initiative to improve the conditions for the houting should be combined with this. In the first instance, this should be concentrated on the most obvious problems such as dams blocking the lower reaches of the watercourses

and improving the conditions for the passage of the fry. Cutting back the plants in those sections of the watercourses most important for the houting should be done differently so as to encourage the growth of evergreen underwater plants. In certain watercourses, this cutting back can be stopped completely, or else organised to create the best possible conditions for the evergreen underwater plants to thrive. Where feasible, banks of stone and gravel could be put down in the watercourses to extend the spawning areas as far as possible.

In bringing the lower sections of the watercourses back nearer to their original conditions, large areas could be established which would be flooded in winter and spring, which in itself is a prerequisite for the survival of the fry.

In parallel with solving the environmental problems, the populations should be restored by releases of fry into the watercourses where necessary.

The following section presents a range of proposals for each of the Wadden Sea watercourses, detailing how the most important environmental conditions can be improved to benefit the houting population.

Varde Å

Here, houting mainly spawn in a short stretch in the lower part of Gl. Varde Å and in the Varde Å below Karlsgårdeværket. At some level the houting can maintain a natural population, but this is small and in danger of extinction. Creating access for spawning fish to larger parts of the water system, and at the same time creating new nursery areas for the fry by restoring the

natural bends of the sections of Varde Å which have been straightened, will provide a secure basis for the restoration of a large and stable population.

- The possibility of migrating to the spawning areas in Holme Å can be ensured by re-routing the flow from the Holme Canal back to the Gl. Holme Å. Fish passages suitable for both spawners and fry should be created at Haltruplund, Puglund, Hesselho and Hovborg fish farms.

- The possibility of migrating to the spawning areas in Grindsted Å can be ensured by taking the flow from Grindsted Å to Varde Å and at the same time creating a fish passage for houting at the dam Ansager Stemmeværk. There should also be fish passages suitable for both spawners and fry at Sig Fiskeri.

- A spawning area for houting could be established in Gl. Varde Å and Holme Å, by creating stretches with gravel and stone where the fall is more than 1.5-2.0 promille.

Rearing conditions for fry can be improved by re-establishing the course of the straightened section of Varde Å, along with creating wetlands linked to the river and flooded in winter and spring.

Sneum Å

Under the existing conditions, it is extremely difficult for the houting to maintain a natural population in Sneum Å, and the species is on the point of disappearing here. If the houting is to be able to live in Sneum Å in the future, it is very important to achieve a number of environmental improvements.

- The opportunities to migrate to the spawning grounds in Sneum Å can be ensured by setting up fish passages suitable for both spawning fish and fry at Endrup Fiskeri and Hjortkær Fiskeri.

- The opportunities for migrating to the spawning grounds in Holsted Å can be ensured by establishing fish passages suitable for both spawners and fry at Bramming Fiskeri, and the fish farms Gørding Mølle, Gørklint Mølle, Holsted Mølle and Hulkær.

- The spawning opportunities for the houting can be improved by establishing stone and gravel beds in the stretches of watercourse where the fall is more than 1.5-2.0 promille.

- Suitable nursery areas for fry can be created by restoring the course of the straightened section of Sneum Å downstream of Størsbøl. As a part of this restoration, several wetlands should be created directly linked to the river which will be flooded in winter and spring.

Kongeå

The same problems identified in the Sneum Å apply to the river Kongeå. Similarly here, the houting finds it extremely difficult to maintain a natural population under the existing conditions. If the houting is to survive and build up a population in the Kongeå, several environmental improvements are essential.

- The opportunities for migration to the spawning grounds in the Kongeå can be ensured by creating fish passages suitable for both spawning fish and fry at the fish farms Jedsted Mølle, Nielsby and Kongeåens.

- Suitable nursery areas for fry can be created by restoring the course of the straightened section of Kongeå west of Vilslev. As a part of this restoration, several wetlands should be created directly linked to the river which will be flooded in winter and spring.

Ribe Å

The houting can maintain a natural population in a certain stretch of the Ribe Å at the tributary Hjortvad Å. However, this population is vulnerable and in danger of disappearing. Recreating the bends in the river west of Ribe and improving the passage conditions at the dam constructions in the city of Ribe would make large spawning and rearing grounds accessible. This would also secure the maintenance of a large population in Ribe Å.

- The opportunities for migration to the spawning and nursery areas in Ribe Å east of the city of Ribe, including Gelså and Fladså, can be ensured by establishing fish passages suitable for houting at one or more of the dam constructions in the city of Ribe.

- The spawning opportunities for the houting can be improved by establishing stone and gravel beds in the stretches of watercourse where the fall is more than 1.5-2.0 promille.

- The nursery areas in Ribe Vesterå could be improved by restoring the natural bends at Ribe Holme along with establishing rearing areas for fry in the form of shallow lakes with weak currents.

- The opportunities for migration to the spawning areas in Gelså and Fladså can be improved by establishing

fish passages suitable for the houting and passages for the fry at the fish farms at Gelsbro and Fole.

Brede Å and Brøns Å

In Brede Å and Brøns Å the houting has access to the entire river systems, as all obstacles have been removed. Even so, the houting can hardly maintain a natural population in Brede Å, as the population is small and vulnerable. Both watercourses lack shallow lakes and bends in their lower reaches which would provide suitable conditions for the fry to survive the first critical months.

- The spawning opportunities for the houting can be improved by establishing stone and gravel beds in the stretches of watercourse where the fall is more than 1.5-2.0 promille.

- Suitable nursery areas for the fry could be created by returning the lowest straightened sections to a more natural course. As a part of this restoration, several wetlands should be created directly linked to the river which will be flooded in winter and spring.

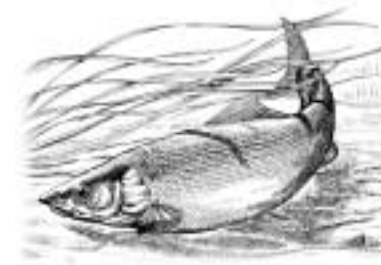
Vidå

Vidå has the largest natural population of houting in the entire Wadden Sea area. It is therefore especially important to preserve this population. However, it is vulnerable, as by far the majority of the spawning grounds are in a single branch of the Vidå system. Creating access for the houting to the entire water system would give a greater security that a large population could be maintained.

- Opportunities for migration to the spawning and nursery areas in Arnå can be ensured by establishing a fish passage suitable for houting at Backmanns Mølle in Tønder.

- The spawning opportunities for the houting can be improved by establishing stone and gravel beds in the stretches of watercourse where the fall is more than 1.5-2.0 promille.

- Opportunities for migration to the spawning areas can be improved by establishing a fish passage suitable for houting and passage for the fry at Rens Dambrug fish farm in Sønderå.



Schedule

A prerequisite for being able to implement the projects is that enough resources are allocated in the next few years to improve the conditions for the houting. This is also a prerequisite for obtaining co-financing from the EU. An assessment of the costs and decision on financing will be conducted for each individual project.

The initiative will last for several years, including planning, applying to the EU for funds and the actual implementation itself. In order to keep an overview, it may be of advantage to divide the projects up into two or more phases.

Phase 1: Project planning and implementation of projects in Varde Å, Ribe Å, Brede Å and Vidå.

In these watercourses, the projects are principally aimed at protecting the existing populations.

Phase 2: Project planning and implementation of projects in Sneum Å, Kongeå and Brøns Å.

The projects in these watercourses are principally aimed at ensuring the survival of the weakest populations by creating new spawning and nursery areas.

The projects in both phases could be implemented on the following schedule:

A: Planning, project outline and prioritisation of the individual constituent projects. Meetings with the fish farmers and riparian owners affected and interest organisations.

B: Negotiating provisional agreements with the fish farmers and riparian land owners involved.

C: Applying to the EU for co-financing.

D: Detailed project planning (requires allocation of resources from the EU).

E: Implementation of the construction work in order of priority.

F: Release of houting into watercourses where necessary. Monitoring the restored watercourses for a number of years, for example to monitor the development of the populations.

