Wetlands capture and bind nutrients and are extremely important for biodiversity. They are both habitats for many plants, and at the same time important spawning and nursery areas for insects, amphibians and fish. Unfortunately, wetlands have become rare; one-quarter of Sweden's wetlands have disappeared via drainage, cultivation or the lowering of lakes, which has consequences, among other things, resulting in decline of the Baltic Sea's pike stocks.

Within the Living Coast project, BalticSea2020, along with the Swedish Anglers’ Association (Sportfiskarna), has constructed a wetland adjacent to the Björnö bay in Stockholm's archipelago. The objective is to strengthen the bay’s pike population. The wetland was completed in 2014, and in the spring of 2016 a dozen pike wandered into it to spawn. Mid-June was the time to drain the wetland and release the fry into the bay.

The emptying of the wetland starts with nervousness and high expectations. Neither Linda Kumblad, associate professor of marine ecotoxicology at BalticSea2020, nor Rickard Gustafsson, a biologist at the Swedish Anglers’ Association, knows with any certainty if there has been a successful pike spawning and if they will find any fry.

The emptying begins early in the morning and it will take many hours before a significant part of the body of water is released into the bay and the pike fry will get caught in Rickard's fry trap. The fry trap captures all larger organisms that leave the wetland.

The wetlands at Björnö bay consist of an embankment by the sea that captures rain and melted snow from the upstream area. The pike reach the wetland via a bypass channel, which is a landscaped fish trail. During spring, there is enough water running through the bypass channel so that adult fish can both swim up to spawn and then down to the sea again when the spawning is over. In early summer, when the water flow decreases, the water stops flowing in the bypass channel. The fry remain in the wetland and grow very rapidly. One month after hatching, which occurs in May, the pike measures between 6-10 cm.

The wetland provides good conditions with low competition for food. Around midsummer time, the wetland is drained via a water level control well, and the fry are spread along the coast belt.
Between the emptying of the fry trap, which Rickard does with at least every half hour regularity, he finds time to tell us about what happened in the wetland from spring until today.

“During March/April the pike swam up into the wetland to spawn, and when they finished spawning, they swam out and left their eggs. The pike is completely dependent upon vegetation in their reproductive cycle, and they spawn in the grass-vegetation and attach the roe on the blades of grass. When the pike roe hatch, the fry live attached to a blade of grass by means of a small adhesive wafer on the head. During this time, they feed on the yolk sac, an egg yolk preserved from the period in the roe. When it is used up, they start swimming freely, they are then about 1 cm, and begin to eat zooplankton found in the wetland. The bigger they get, the bigger prey they can catch. When they are about 2 cm, it may occur that they start to eat each other. They are very gluttonous! Pike fry can actually bite off more than they can chew and eat too large prey for their own size. This can lead to them suffocating. But they can eat prey 2/3 their size without any problems.”

The hours pass and the water level is steadily decreasing in the wetland. It is teeming with activity in the bottoms, which are exposed when the water subsides. Among other things, there are mosquito larvae, dragonfly and damselfly larvae, diving beetles, water isopods, notonectidae and corixidae, snakes, perch, roach, sticklebacks and tadpoles.

“These environments are naturally flooded during the spring floods and then gradually dry up during early summer. Draining by digging ditches has meant that the gradual lowering of the wetlands has seized and the water level drops too quickly in the spring. What we do today is simply to gradually reduce the wetland down to the stream.

Now the last pike fry swim into the bay, some have swum out before, but now is the last push. We take this opportunity to do a test round of fishing, i.e. count the fry caught in the trap and then release them into the Björnö bay,” Rickard tells us.
Since the bypass channels are parched, the water level control well serves a very important function, according to Rickard. What would happen if the wetland is not emptied?

"Without a steady supply of water, there is a risk that there will be a lack of oxygen in the wetland. Moreover, it would become overgrown with reeds, cattails and other fast-growing vegetation if we do not lower it. When we raise and lower the water level, we stress the vegetation and therefore achieve a greater diversity with more grass-like vegetation. In turn, this variation establishes good living conditions and habitats for birds, pike and insects. A shallow wetland with grass-like vegetation warms up quickly during the spring, giving all the species that grow up here a good start to their lives. There is plenty of food for the newly hatched pike, and they grow considerably faster than those along the coast. The largest are already about 10 cm."

"Every waterway is extremely important” and therefore achieve a greater diversity with more grass-like vegetation. In turn, this variation establishes good living conditions and habitats for birds, pike and insects. A shallow wetland with grass-like vegetation warms up quickly during the spring, giving all the species that grow up here a good start to their lives. There is plenty of food for the newly hatched pike, and they grow considerably faster than those along the coast. The largest are already about 10 cm."

Pike eat roach, which in turn eat the zooplankton. The zooplankton eat phytoplankton (microscopic marine plants); when zooplankton are plentiful, the quantity of phytoplankton decreases. Phytoplankton blooms when there are plenty of nutrients in the water.

"We can also make wetlands for perch," Rickard tell us. "On Gotland, burbot has spawned in wetlands, which is unusual, so there are many species who benefit from this, but mostly pike."

What does the future hold for this wetland?

"Pike, just like salmon and trout, have a behaviour which compels them to return; they come back to the place where they have spawned previously or where they were born. It is therefore very important that all watercourses are maintained and continue to function properly. Each and every waterway is extremely important! This wetland will remain and continue to produce more fry in the future."

After a long day, the wetland is drained. Around 200 pike fry and a smaller number of adult individuals have moved from the wetland to the Björnö bay. But it is very difficult to say with any precision how many fry spent the first months of their life in the wetland. One thing is certain however – It has been a productive first spring and early summer in the wetlands! Linda believes that the conditions will be even better next year when new grass and sedge varieties will have grown and covered the emptied wetland. We keep our fingers crossed and wish this year’s pike fry good luck at sea!
Other findings in the wetland

**Diver larva.** This caterpillar will be developed into a diving beetle. In the larvae stage, they live in the water but require oxygen. By holding its rear above the water, it can breathe. The larvae are ravenous with powerful jaws. They inject a liquid into their prey, which stuns it and dissolves its innards. They then consume the prey’s guts.

**Water Scorpio.** This insect can be found slowly creeping around on the bottom and breathing through a breathing tube in the rear body.

**Roach fry.** This fish is one of Sweden’s most common freshwater fishes, but it can also be found in brackish water. They live in shoals and eat zooplankton, larvae, crustaceans, snails and insects, among other things.

**Tadpoles.** Small bones have begun to form on the fry. The skin is covered with a toxic secretion to protect it from being eaten by other animals.

**Perch Fry.** The coastal shoals migrate up to fresh water in order to spawn, just like the pike. They lay eggs in egg strings, which they attach to vegetation.

**Stickleback fry.** The males acquire a mating appearance during the breeding period and builds a nest on the bottom, consisting of plant parts and kidney secretions. The male then tries to attract females to lay eggs in the nest which he can then fertilize. The male guards the roe until they hatch and stay for about one week, protecting the fry.

**Snails.** Water snails are hermaphrodites, i.e. they are both male and female. Despite this, they must find another shell to mate and lay eggs.

**Notonectidae – “back swimmers”.** This small insect swims on its back, and then floats to the surface for air.

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