The Swedish Pool frog – a conservative little fellow at the Swedish Riviera

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Popular scientific summary of Independent work in biology 2013
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All over the world amphibian populations are declining due to habitat loss and over-exploitation. This is also the case for some Swedish amphibians, such as the pool frog. This aquatic frog is a remnant in Sweden from the last glacial period 10 000 years ago. Since then the climate has grown colder and its distribution in Scandinavia has decreased to some 60-120 pools along the coast of Uppland County. Its closest conspecifics are found in central Europe where they are quite abundant. These however, vary from the Swedish population in both genetics and morphology. Being divided into several small separated populations, the Swedish pool frogs are dependent on being able to disperse between breeding ponds. This makes them very vulnerable to habitat fragmentation and forestry pose a severe threat as it obstructs them from spreading, which might endanger the survival of the entire population.

Two pool frogs, a bigger female to the left and a male to the right. Notice the difference in colouration; the female has a much darker back than the olive-coloured male. The pale stripe on the back is an eye-catching characteristic for the species. Photograph by Per Sjögren-Gulve.

Amphibian declines

Amphibian populations are declining globally; some because of over-harvesting, some due to habitat loss and fragmentation, and for some the reason is unknown. This rapid decline in amphibian populations due to unknown reasons is the biggest of its kind ever recorded. Many species are listed as possibly extinct as there is not enough information to make a confident statement about their status. Due to this, the estimated number of amphibian species that have gone extinct since the 1980's vary between 9-122 species. This in itself is a great problem, how are you supposed to conserve a species if you do not know whether it is extant or not? As well as information about the status of a species, its habitat preferences and threats towards it is also crucial in the work for conservation.

Threats towards the pool frog

The pool frog lives in what is called a *metapopulation*, this means that there are several small separate groups where some will go extinct while others will colonize new areas. To be able to colonize a new habitat and keep the population at a viable status, the pool frog must be able to disperse between ponds. Spreading between ponds is also very important to avoid inbreeding in such small populations. This dynamic of the pool frog population is very important to be able to assess how to put in the right measurements of conservation. Another specific trait is its love of warmth; the pool frog requires a warmer climate than any other Swedish amphibian to breed. This means that combined with the small isolated populations, the Swedish pool frog is highly vulnerable to unpredictable weather changes and cold weather. During especially cold years, the reproduction can fail completely, causing severe fluctuations in the size of the population.

What is fragmentation?

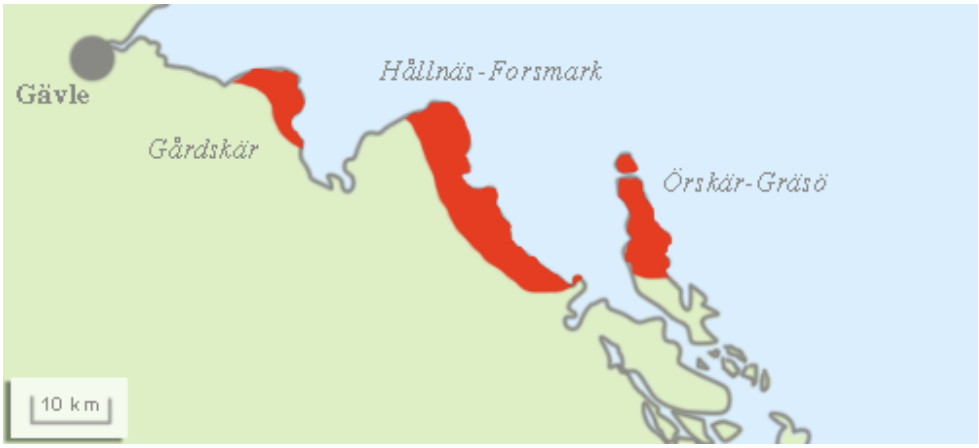
In a fragmented landscape, the pool frogs will be obstructed from reaching other suitable ponds. This fragmentation causes remaining populations to become more isolated and increases the risk of inbreeding and extinction. There are a few different factors that lead to this fragmentation, among other things natural overgrowth of their ponds, though this is greatly sped up by eutrophication from nearby agriculture. However, the most severe cause of fragmentation is human disturbances, especially clear-cuts and ditching. Up until the early 90's you could actually get subsidies for making ditches. Luckily, for the frogs, ditching became prohibited in large parts of Sweden in 1994. However, old ditches that have not been dammed still pose a threat as they lower the ground water levels in the nearby area, causing the environment to become dry and arid. Especially for amphibians this constitutes a great problem, as their skin needs to be constantly wet they cannot survive in this environment for long. Ditches are therefore one of the biggest threats toward the Swedish pool frog.

Swedish Pool Frog

Scientific name: *Rana lessonae*
Size: < 9 cm
Colouration: females have a dark brown back while males have a golden, olive colour and paired, whitish vocal sacs. Both sexes have a characteristic, pale stripe on the back.
Distribution: along the northern coast of the Uppland County
Average lifespan: 2.5 years, maturity is reached after 2 years

Other threats

Clear-cuts and ditching are not the only troubles for the pool frogs. There are several different predators such as: dragonfly larvae, diving beetles and newts that predate on the eggs and larvae while pike, grass snake, mink and gray heron all hunt the adult frogs. The changing climate also poses a threat. Indeed, the pool frog will benefit from the increased temperature. However, the melting poles, and thereby increased sea levels, will level out the land uplift on which the pool frog depends. This uplift is vital to creating new habitats as it separates small bays from the sea, creating ponds in which the pool frog can live.



The distribution of the pool frog at the Uppland coast. Drawn after Nilsson 2013.

Conservation

During the past ten years the local authorities in Uppsala County have established an action program (in sw. *åtgärdsprogram*) with plans of actions to help the pool frog. Some of these conservation acts include restoring wetlands and adapting the forestry to conservational goals. The action plan also concludes that a good measure to conserve species is the establishment of nature reserves. Along the Uppland coast, there are several nature reserves. The pool frog is protected by Swedish law, which states that it is forbidden to catch it, kill it or destroy breeding ponds. Besides being protected by Swedish law, the pool frog also receives certain attention from the European Union. The EU has created an ecological network of protected areas within the boundaries of the member states, called the Natura 2000. This network exists as a protection for endangered species listed in the Habitats directive. The pool frog is listed as a species that is protected even outside the borders of this ecological network.

The Red list

The International Union for Conservation of Nature (IUCN) has a red list where species threatened with extinction or at risk to be threatened are listed. This is an ongoing work used both internationally and nationally, and some species have different classifications in different countries. For example: the pool frog is listed as least concern (LC), the lowest level of threat, internationally. In Sweden however, it is listed as vulnerable (VU) due to the fact that its habitat here is declining and exhibits increasing fragmentation.

The different classifications in the IUCN red list, where the seriousness of threat decreases to the right. The highlighted circle shows the classification of the pool frog in Sweden. EX = extinct, EW = extinct in the wild, CR = critically endangered, EN = endangered, VU = vulnerable, NT = near threatened, LC = least concern. Graphic by Peter Halasz 2006, from Wikimedia Commons.

Why should we conserve species?

The need to conserve species has several different reasons; for starts, one can argue that all species have what is called *intrinsic value*. This means that every species have a value on their own, only by existing. Secondly, biodiversity and wildlife contributes to humankind with so called *ecosystem services*. These services include creating an atmosphere for us to breathe, providing us with food, medicine and an environment to live in. Thirdly, nature and wildlife both have high recreational, cultural and, to some extent, economic values for mankind. Many people seek nature while on holidays and appreciate it highly. One might simply argue that it is our shared responsibility to conserve the wildlife of today for the benefit of our future generations. But how should we do it? Like mentioned earlier, it is difficult to preserve a species if you do not know anything about it. This highlights the importance of conducting regular censuses to obtain enough information about species to know whether or not they still exist in the wild and how to protect them.

> "How are you supposed to conserve a species if you do not know whether it is extant or not?"

Future prospects

Not only do we need to preserve biological diversity to maintain the ecosystem services we so highly depend on, one can argue for the intrinsic value of all species existing. Also, considering the sheer beauty of nature and the effect it has on human wellbeing, it should be viewed as our collective responsibility to preserve it. As amphibians worldwide are being threatened with extinction due to habitat loss and over-harvesting, every country should strive to conserve its species. The Swedish pool frog is of particular value as it is both genetically and morphologically different from any conspecifics. To ensure the pool frogs survival, it is important to decrease the habitat loss caused by clear-cuts and ditching, as well as facilitate the dispersal between breeding ponds. Not only should the local authorities work on this conservation, landowners need to be informed of the importance of their contribution to the conservation of the pool frog. Together, we might be able to save this green little scallywag from extinction.

For further reading:

Rubin M. 2013. Hotbilden mot den svenska gölgrodan (*Rana lessonae*) och vilka åtgärder som finns. Bachelor thesis. Uppsala University, Uppsala. (In Swedish)

Edenhamn P, Sjögren-Gulve P. 2000. Åtgärdsprogram för bevarande av gölgroda (*Rana lessonae*). Naturvårdsverket, åtgärdsprogram nr 18. (In Swedish)