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Native fish species under pressure in the Engadine and Poschiavo

An international research team led by Eawag, Bern University and the Bern Natural History Museum has shed light on the depths of alpine and prealpine lakes. In “Projet Lac”, fish populations – such as those in Lake Sils (Silsersee) and Lago di Poschiavo – have been surveyed more systematically than ever before.

From 2010 to 2014, a total of 26 prealpine lakes were studied as part of Projet Lac, with over 60 fish species being recorded. In 2012, in cooperation with Canton Graubünden's Hunting and Fishery Office, surveys were carried out on Lake Sils in the Engadine and Lago di Poschiavo. The results, now available, show that both of these lakes harbour a commercially attractive salmonid community. However, both lakes' historical diversity has been significantly affected by the introduction of fish species from several other catchments – in particular, the Arctic char (*Salvelinus alpinus*), Canadian lake trout (*Salvelinus namaycush*) and brown trout (*Salmo trutta*). Genetic analyses indicate that the non-native fish have interbred with indigenous species, leading to substantial losses of biodiversity. The distinctiveness of the original Lake Poschiavo trout, for example, has largely been lost. In Lake Sils, however, an indigenous population of Black Sea trout (*Salmo labrax*) seems to have survived despite stocking with brown trout.

Netting versus angling

From an angling perspective, catches of Arctic char in Lake Sils have declined sharply in recent years, while in Lago di Poschiavo catches of this species have increased dramatically since it first appeared in the early 2000s. Thus, almost five times more Arctic char are now caught in Lago di Poschiavo than in Lake Sils. One of the goals of the project was to find out where Arctic char occur in Lake Sils and why the population appears to be seriously declining. Interestingly, the standardized net catches tell a different story than the anglers' catches, indicating that Arctic char density in Lake Sils is currently similar to that in Lago di Poschiavo. Accordingly, the lower catches cannot (or not wholly) be attributed to a decline in the population of this species in Lake Sils. The size of Arctic char was also comparable in the two lakes, arguing against lower growth. It must therefore be assumed that the fish in Lake Sils are more difficult to catch than in Lago di Poschiavo. This could be due, for example, to different feeding habits in the two lakes.

Baseline for future monitoring

The standardized data obtained in Projet Lac can be used as a reference. If lakes are altered by environmental factors – e.g. as a result of pumped-storage operations – the effects on fish populations can subsequently be assessed. In Lago di Poschiavo, the researchers' representative sampling shows that trout are mainly caught in the littoral zone – i.e. in the shallow waters close to the shore. Arctic char favour depths of 20–40 metres. The two commercially most important species thus prefer habitats which would be most severely affected by possible pumped-storage operations on Lago di Poschiavo: littoral areas would often be dewatered as a result of regular raising and lowering of water levels. At depths of 20–40 metres, such operations would increase lake water temperatures by up to 4°C. This suggests that pumped-storage would have an impact on fish population sizes in Lago di Poschiavo.

Rationale for compiling an inventory

Under Switzerland's fisheries legislation, the distribution of fish species has to be precisely documented. Similar provisions are included in the EU Water Framework Directive. Statistical data is required to indicate which species are endangered and need to be protected. In fact, however, little is

known about the species occurring in Europe's larger lakes. In most cases, the only available data comes from fishery statistics. These indicate how many of which species of fish have been caught or used for stocking, but the actual diversity is generally unknown.

In 2010, therefore – the International Year of Biodiversity – Project Lac was launched by Eawag, Bern University, the Bern Natural History Museum and other (international) partners, with the aim of shedding light on the depths of prealpine lakes. The larger lakes were to be systematically sampled using standardized methods; specimens were to be identified, measured and photographed; and catch data was to be statistically analysed. "We were thus able to determine for the first time what level of fish biodiversity remains in our lakes," says project leader Professor Ole Seehausen of Eawag and the Bern University Institute of Ecology and Evolution. "We also wanted to find out why species diversity and composition vary – sometimes widely – from lake to lake, and investigate the ecological factors underlying the emergence or disappearance of species."

Supporting conservation measures

Ole Seehausen is convinced that the data generated by the CHF 2.4 million project will promote the protection of fish biodiversity in Swiss lakes: "Our results indicate, for example, how lakeshore rehabilitation or the enhancement of shallow water zones should be carried out so as to maximize the chances of success." The project brings together experts from various neighbouring countries, as the ultimate aim is not just to improve scientific knowledge, but to preserve fish populations in alpine and prealpine lakes for the future. In addition, an extensive collection of fish and tissue samples is being built up at the Bern Natural History Museum, which should serve as an international reference for future research projects.

Photos available for download at: www.eawag.ch > Media



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A public information event on the findings from Lake Sils and Lago di Poschiavo will be held on 27 March 2015 at 19:00; Auditorium Academia Engiadina, Samedan.
– presentations in German and Italian –