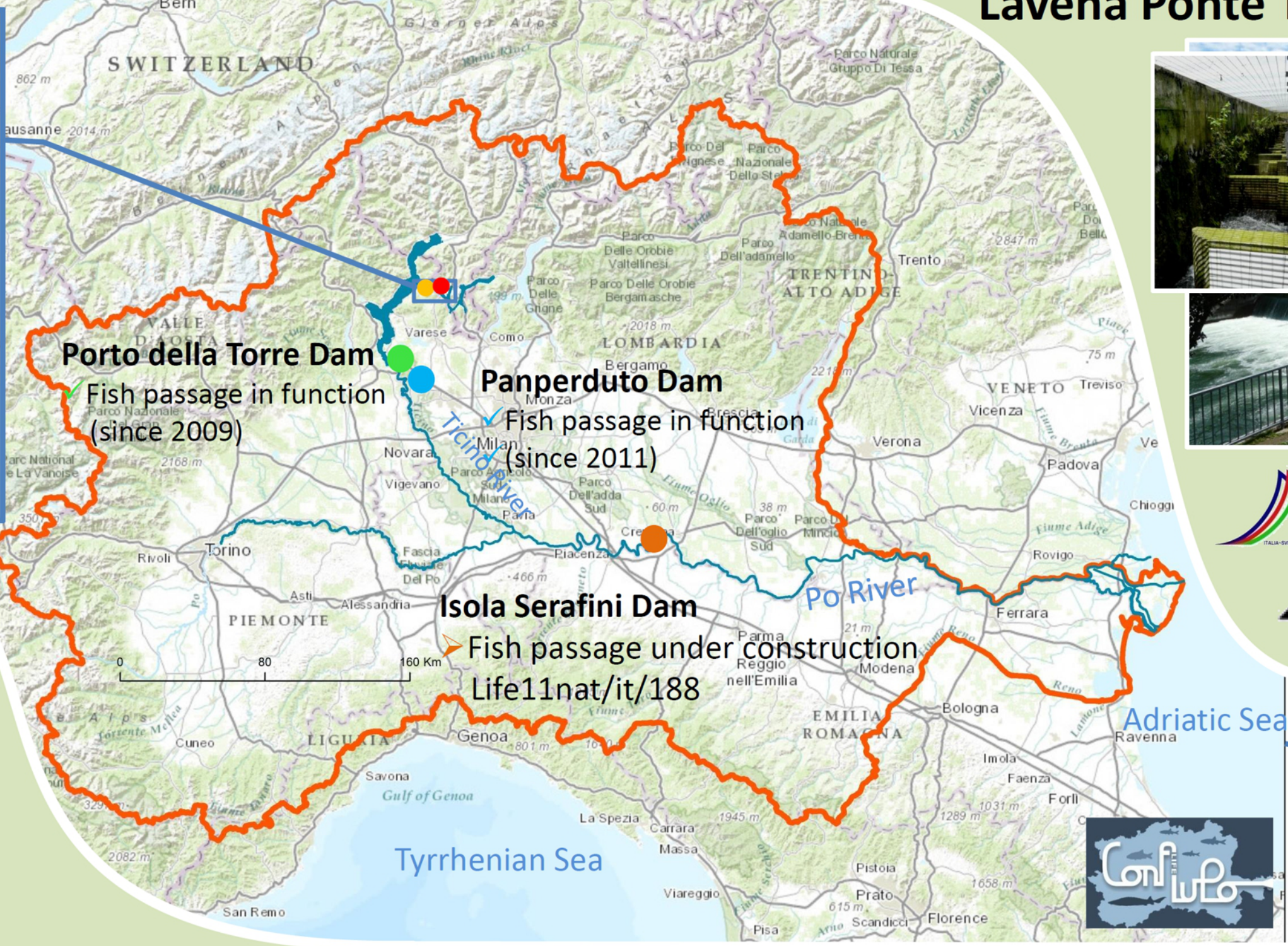
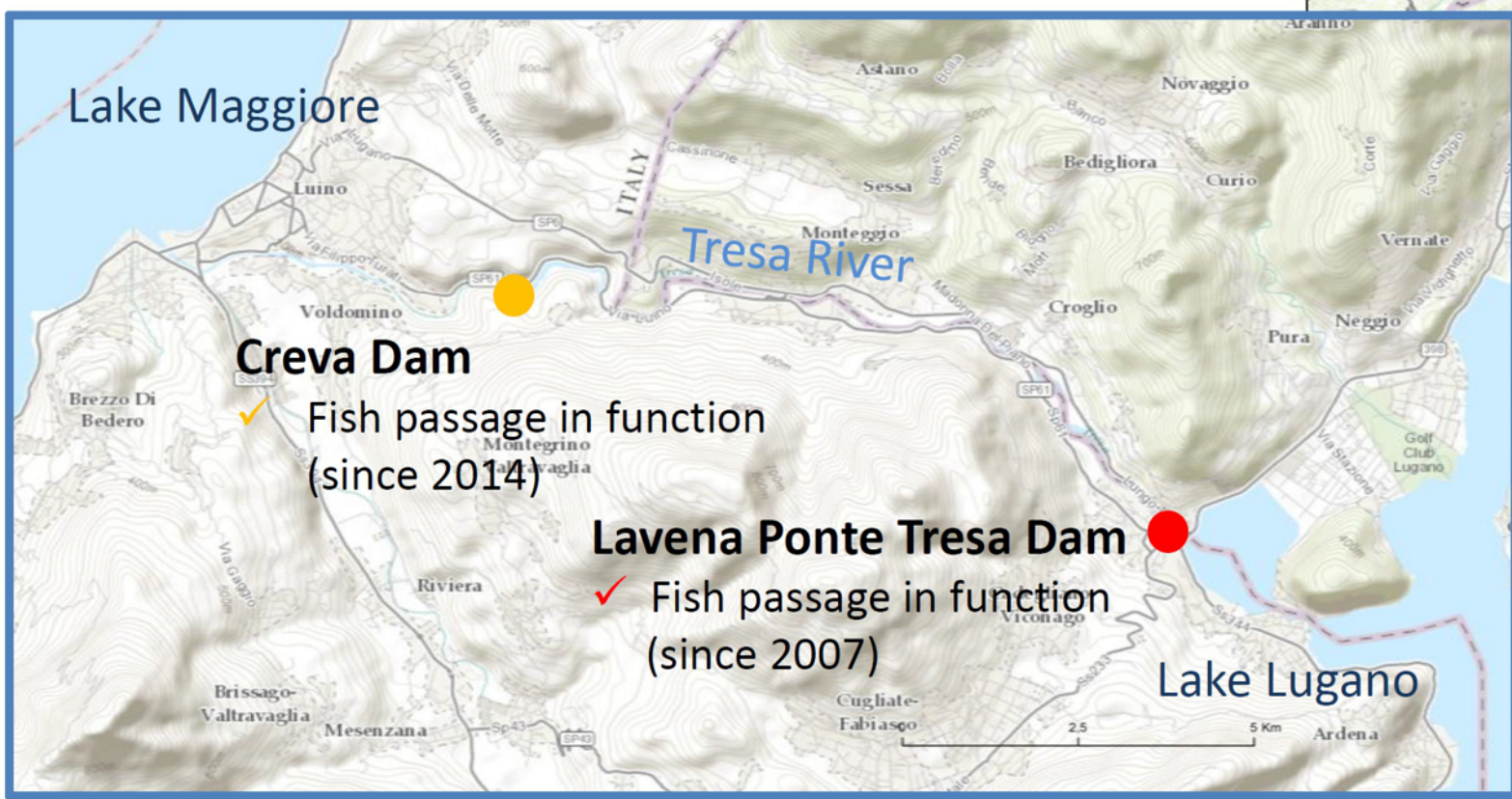


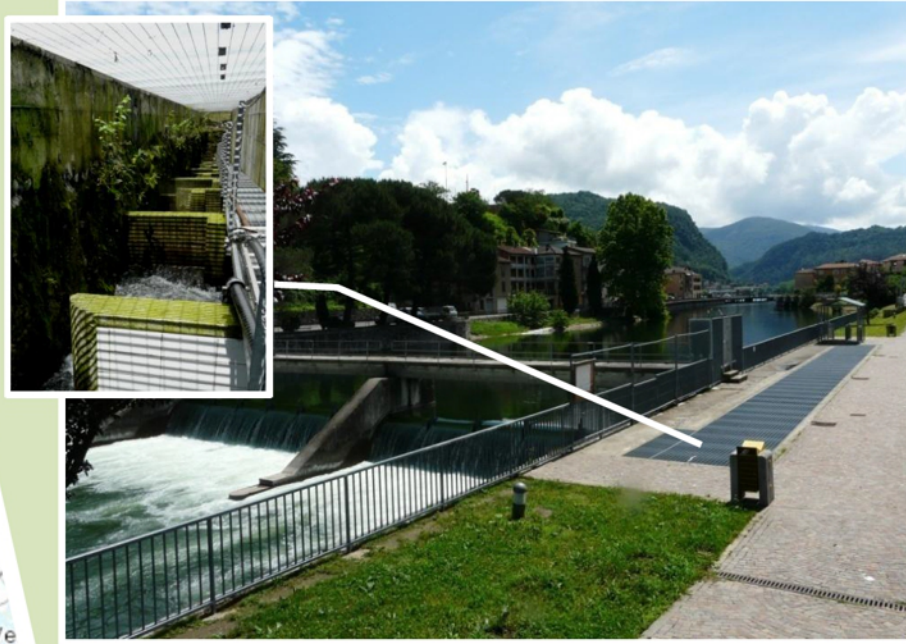
The Tresa River connectivity restoration

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The Po River basin is the richest Italian basin in term of fish biodiversity: Lombardy Region, which lies completely within this basin, has much attention towards the river connectivity restoration. Examples of the results achieved in this field are the two fish passages which were recently realized on the Tresa River (Varese, Lombardy). The Tresa River connects Lake Lugano to Lake Maggiore belonging to the Ticino River basin, tributary of the Po River. The upstream dam (Lavena Ponte Tresa Dam) has a 2.3 m Δh drop, while the downstream one (Creva Dam) is a hydropower dam with a 23 m Δh drop. Both these dams have been equipped with a concrete pool and weir fish passage: the designing of the second one faced a number of difficulties as the consistence of the drop itself; the limited space available and its rocky steep slope nature; the reservoir daily level variation (> 4 m). This poster illustrates the engineering challenge faced and solved, and the results of the monitoring campaign.



Lavena Ponte Tresa Fish Passage ●



Creva Fish Passage ●



POOL CHARACTERISTICS	
POOL DROP (Δh)	0,30 - 0,34 M
HEAD ALTITUDE	229,00 - 232,00 M A.S.L. (DEPENDENT ON RESERVOIR WATER LEVEL)
TAIL ALTITUDE	207,76 M A.S.L.
POSITION OF THE ORIFICES	BOTTOM WEIR
BOTTOM WEIR WIDTH X HEIGHT	0,30 M X 0,60 M
POOL LENGHT	2,75 M
POOL WIDTH	1,50 M
FISHWAY CHARACTERISTICS	
DISCHARGE	283 - 303 L/s
NUMBER OF SLOTS	71
TOTAL LENGHT	210 M
MEDIUM SLOPE	10 %
DIMENSIONING VALUES	
SPECIFIC POWER DISSIPATION [W/M3]	150-170
POOL LENGHT/POOL WIDTH RATIO	1,8
WATER DEPTH/POOL DROP (Δh) RATIO	>5
RANGE RECOMMENDED	
CYPRINIDS < 150 SALMONIDS < 200	
1,6 - 1,8	
>2	



Fish passages monitoring

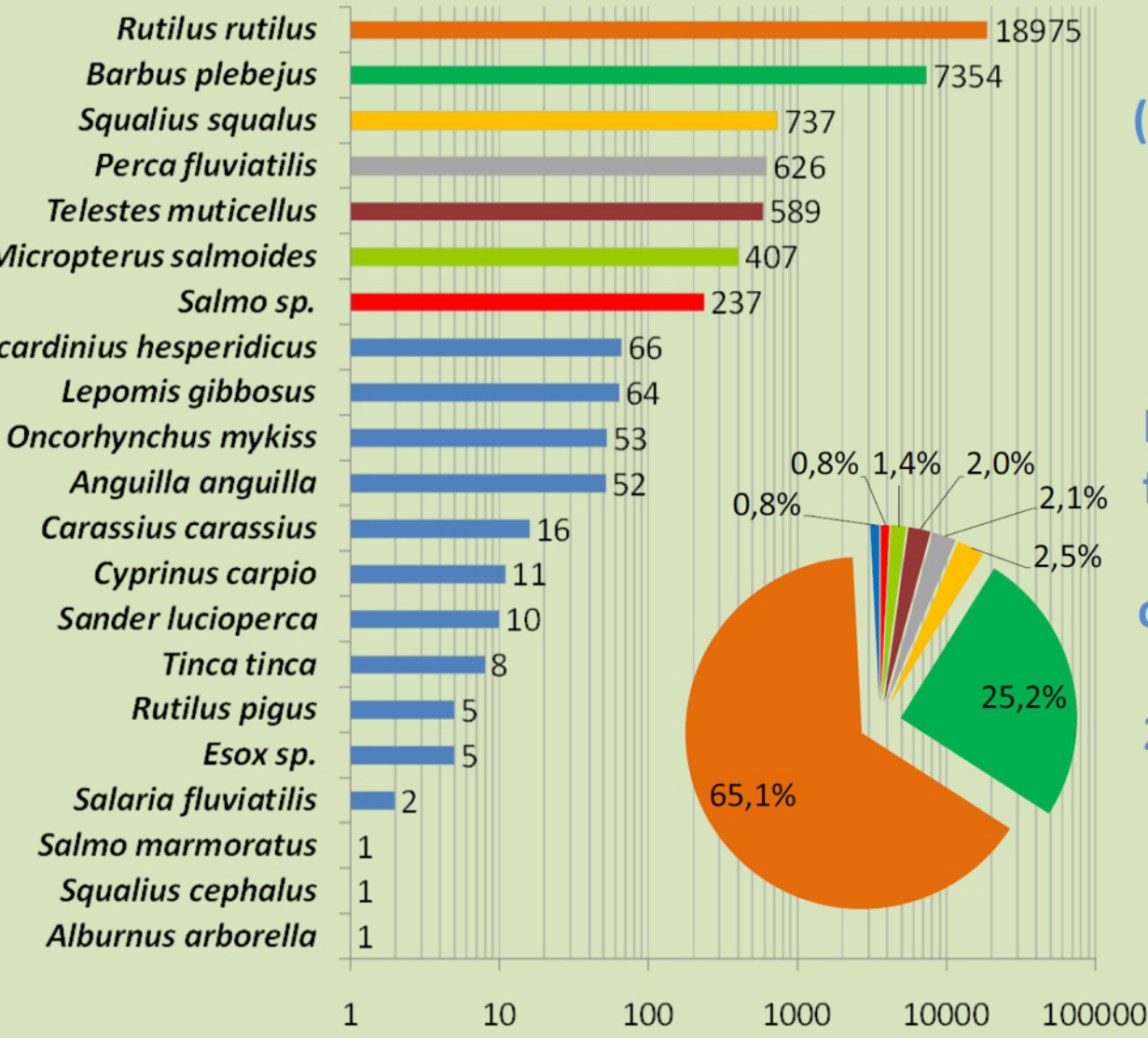
Both the fish passages have a monitoring room with a window looking out into the fishway, allowing to observe the fishes. The monitoring rooms are equipped with a H24 video monitoring system composed of a video camera connected to a PC, with a specific software installed on it. The name of the software is "Fish Tick Standard and Plus Package - Version 2.6" made by Salmonsoft



(Portland-USA); this software processes all the images captured by the camera, detecting and storing only the frames containing fishes, making then videos of different length.

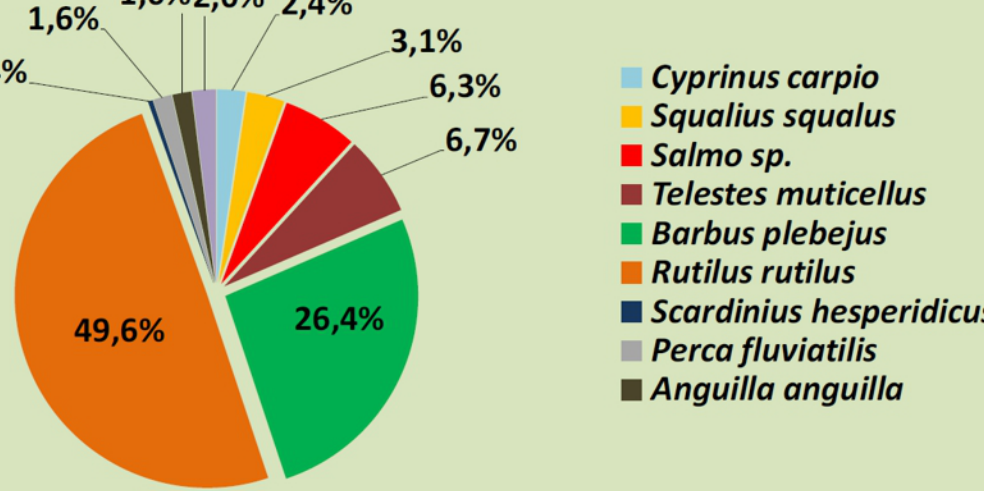


Main results



Species identified and number (absolute value and percentage) of specimens of each species observed passing through Lavena Ponte Tresa fish passage. These data have been collected since may 2007 until march 2015 in 970 days of monitoring

Species identified and percentage of specimens of each species observed passing through the Creva fishway. These data have been collected since may 2014 until march 2015



Conclusions

- The fish passages show their desired nonspecificity (21 *taxa* observed); at the same time every species (lacustrine species too) proves its need to move along the river.
- The monitoring action confirmed the effectiveness of both the passages, pointing out some bio-ecological aspects (species composition, structure of populations, ethology, etc ...) hard to define by other sampling methods.
- Some species (*Barbus plebejus*, *Telestes muticellus*, *Salmo sp.*) exhibit a high confidence with the structures: we have recorded some feeding and reproductive behaviors.
- Tresa River defragmentation represented a milestone for the restoration of the Po River basin connectivity (Life11nat/it/188): with the completion of Isola Serafini Fish Passage works (2017), the migratory route from Adriatic Sea to Lake Lugano (and vice versa) will be reestablished.

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