## Supplementary figures

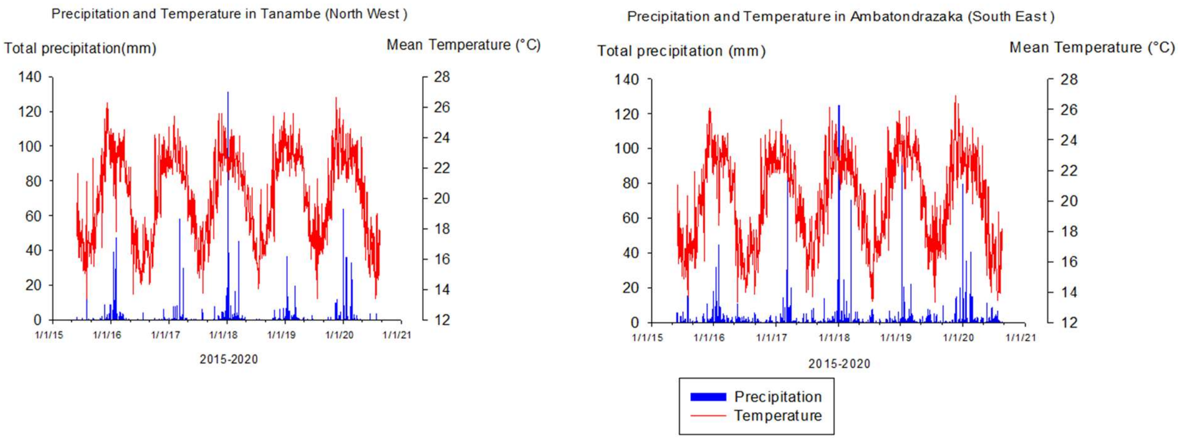


Figure S1: Temperature and precipitation in the North-West of Lake Alaotra and South-East of Lake Alaotra (Source: https://www.meteoblue.com/historyplus)

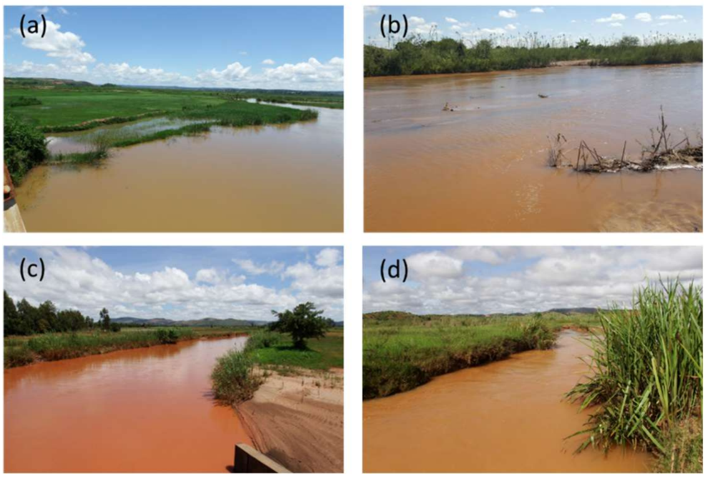


Figure S2: Rivers draining into Lake Alaotra: (a) River Sahabe, (b) River Ranofotsy, (c) River Anony and (d) River Sahamaloto (pictures taken in January 2019 by V.F. Razanamahandry).

Figure S3: Picture of the Maningory (the outflow of Lake Alaotra) taken in January 2019 by V.F. Razanamahandry.

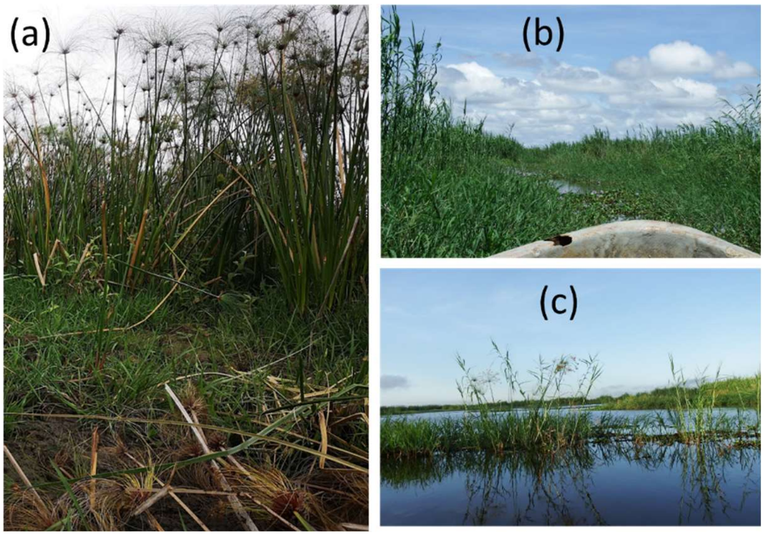


Figure S4: Wetland environments around Lake Alaotra: (a) the vegetation in the central part of the marshes (b) vegetation along a canal entering into the marshes from the South-East of the lake, (c) part of the marshes that always underwater during the whole year season in the marshes (all of these pictures were taken in September-October 2019 by V.F Razanamahandry).

Figure S5: Floodplains surrounding Lake Alaotra used as ricefields (picture taken in February 2019 by V.F. Razanamahandry).

**Supplementary materials & methods**

Additional parameters, such as major elements of water samples (Na, Mg, Si, P, S, K, Ca, Fe, Sr, and Ba) and stable hydrogen and oxygen isotope data of surface water samples, have been analyzed but were not included in the manuscript discussion. Nevertheless, they are included in the supplemental data in order to enable and stimulate their use by the scientific community, e.g. in regional or global syntheses. Water samples for major element concentrations were filtered with 47mm pre-combusted filters, followed by filtration on 0.2µm syringe filters, and no preservation was added. Prior to analyses, they were acidified with ultrapure $HNO_3$ before being analyzed using inductively coupled plasma mass spectrometry (ICP-MS, Agilent 7700x). For the analysis of stable oxygen and hydrogen isotope ratios in water ($\delta^{18}O$-$H_2O$ and $\delta^{2}H$-$H_2O$), 10 mL of 0.2 μm filtered water samples were collected and stored in a HDPE vials. $\delta^{18}O$-$H_2O$ was measured by equilibration with $CO_2$ using a Thermo Finnigan GasBench II coupled to a Thermo Finnigan Delta XP IRMS (GB−IRMS). A 0.5 mL subsample was transferred into a 12 mL Labco exetainer, flushed with helium, and 40 μL of pure $CO_2$ was manually added. Samples were equilibrated at 25 ºC in the thermostated tray for over 24 h. Three in-house water standards ($\delta^{18}O$ =+6.87 ‰; −7.19 ‰ and −22.31 ‰; normalized to VSMOW) were used to calibrate $\delta^{18}O$ values (Vienna Standard Mean Ocean Water)/SLAP (Standard Light Antarctic Precipitation) scale). To analyse $\delta^{2}H$- $H_2O$, 2 mL of pre-filtered water was transferred into a clear glass 12 x 32 mm screw neck vial that is sealed with a blue 12 x 32 mm screw neck cap and preslit PTFE/Silicone septum. A 2 μL aliquot of the sample was automatically injected 4 times using a TriPlus autosampler into a Thermo Flash HT/EA elemental analyzer coupled to a Thermo Delta V Advantage IRMS. In the HT/EA, water was transformed to $H_2$ by thermal decomposition at 1000°C in a quartz reactor packed with reduced chromium. Data were corrected using a linear regression with a set of four in-house water standards analyzed in parallel with the water samples: ANTAR (-247.12 ‰), CLWS (+48.97 ‰), LTWS (-48.36 ‰) and SZWS (+0.46 ‰). These water standards were calibrated with VSMOW, SLAP and GISP (Greenland Ice Sheet Precipitation) and all $\delta^{2}H$ value are reported relative to VSMOW.