

LAKE ICHKEUL - BIZERTE BASIN

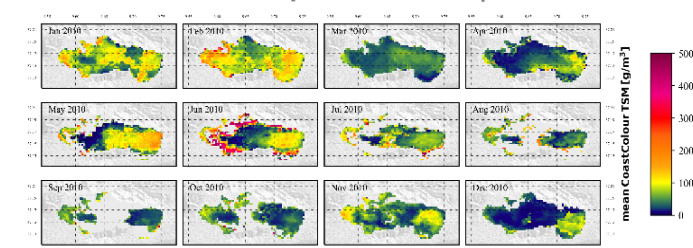
SPOTLIGHT

The Ichkeul National Park is the most important area in North Africa for the migratory Palaearctic waterfowl with peak winter records of up to 100,000–200,000 birds.

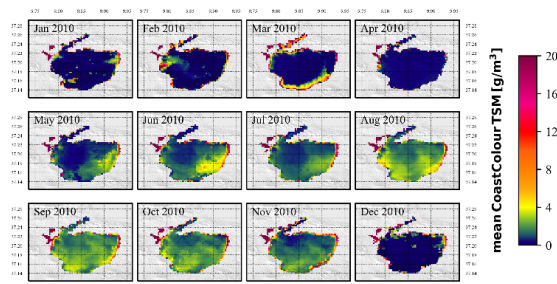
[Casagrande and Boudouresque, 2010] [2]

WATER QUALITY PRODUCTS

Total Suspended Matter | TSM



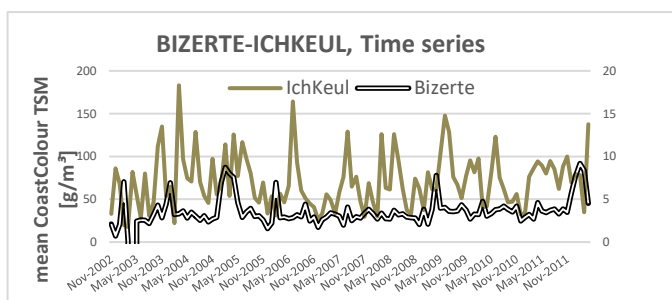
[A]



[B]

all maps: courtesy D. Odermatt

Description: Maps of satellite-derived monthly averages of the total suspended matter (2010) of Lakes Ichkeul [A] and Bizerte [B] show spatio-temporal variations in TSM concentration for both lakes with much higher concentrations in Lake Ichkeul (the maps have different scales). The highest monthly concentration for Ichkeul is in June and might be influenced by water level changes. Lake Bizerte shows clear water until April and increasing concentrations from May onwards. The spatial pattern of TSM in Ichkeul may be related to where the main rivers enter the Lake and volume of surface runoff during peak rainfall. Bizerte shows relatively higher TSM concentrations throughout the year on the north-western and eastern part of the lake while clear water from the Mediterranean enters in the North East.



Description: Trends of TSM concentration for the Ichkeul and Bizerte lakes (different scales)

FAST FACTS

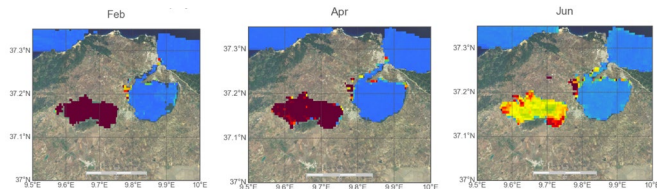
- The Ichkeul - Bizerte Basin is located in the northern part of Tunisia covers an area ~ 3084 km², with the Ichkeul lake linked to the Bizerte Lagoon by the Tinja Canal.
- The Basin was demarcated as a biosphere reserve in 1977, a UNESCO World Heritage site in 1979, and as a RAMSAR site in 1980.
- The Ichkeul National Park is the most important area in North Africa for the migratory Palaearctic waterfowl with peak winter records of up to 100,000–200,000 birds (Casagrande and Boudouresque, 2010). [2]
- Anthropogenic activities (e.g. burning of coal, oil, gasoline, trash, tobacco, and wood) in the region is identified to increase the concentration of toxic environmental Polycyclic aromatic hydrocarbons (PAHs) total concentrations in sediments in the lakes (Du and Jing, 2018). [3]
- Mathlouthi et al. (2011) cited in Jemai et al. (2013) also reported that extreme rainfall events of 2005 resulted in landslides in Ichkeul - Bizerte Basin. [4]
- In Winter, there is often increase in the water levels of Lake Ichkeul due to increased freshwater inflows from six main wadis, namely, the Doumiss, Sejhane, Melah, Ghezala, Joumine, and the Tine. (Jemai et al. (2013). [4]
- The increased water inflows into the Ichkeul often leads to water flowing from the lake (about three times its volume during winter and spring) into the Bizerte Lagoon.
- During summer, water levels fall in the Ichkeul which results in Wadi Tinja transporting salting water from the Bizerte Lagoon into the Ichkeul Lake (Jemai et al. 2013). [4]
- According to Benzarti and Habaieb (2001) cited in Jemai et al. (2013) rainfall varied with the effect of altitude, proximity to the sea (longitude and latitude), continental effects, and regional and local climate factors, from the north to the south of Tunisia. [4]



Sentinel-2 MSI image of Lake Ichkeul and Bizerte lagoon 2018/02/28 [5].

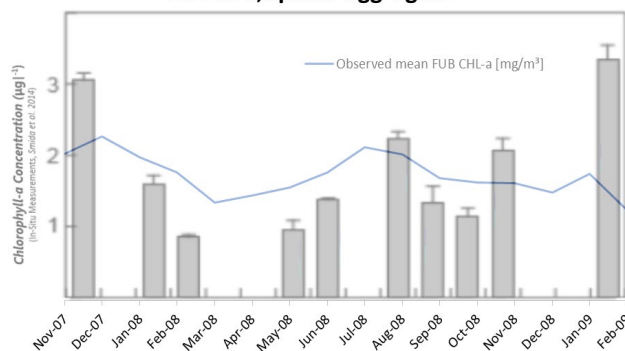
The time series (graph on previous page) shows the differences of concentration in both lakes and the trends throughout the different seasons. For Bizerte, 2004-2005 show higher concentrations than for the other years, while Ichkeul has peak months across all years.

Chlorophyll-a Concentration

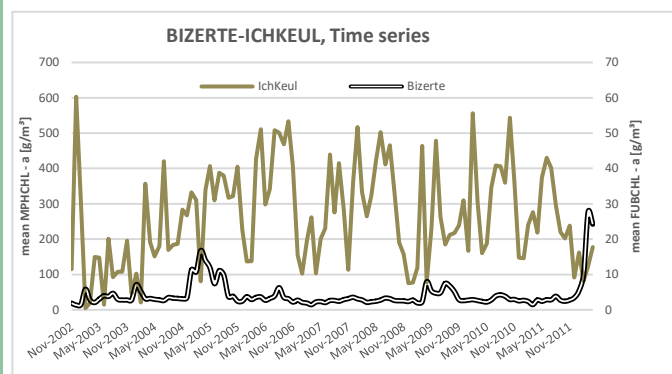


Description: Maps of satellite-derived monthly averages of Chlorophyll-a Concentration for three months in 2011 of Lake Ichkeul and Lake Bizerte (source: MERIS, [6], [7]) showing the high differences between both lakes.

BIZERTE, spatial aggregate



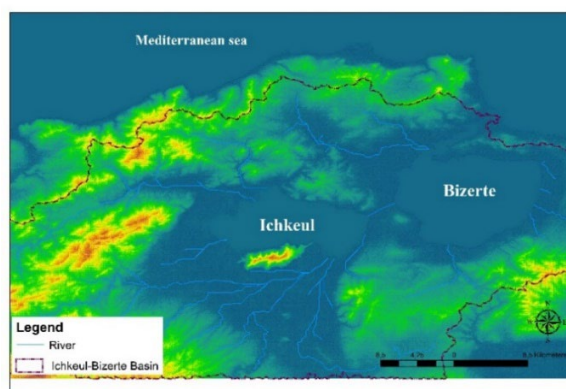
Description: A comparison between in-situ measurements [8] and satellite-derived chlorophyll concentration [6, 7] for Bizerte show a good agreement of both measurement techniques, both in the overall level of concentration as well as the differences between the months. The in-situ data are compiled from different stations across the lake, while the satellite data are monthly averages of the entire lake area.



Description: The time series show the differences of chlorophyll concentration for both water bodies (different scales). The connection of the Bizerte to the Mediterranean Sea is responsible for the different water regimes of both water bodies. There was a positive trend of concentration in the Ichkeul from the years 2002 to 2006, interrupted by a minimum in November 2006/Mai 2007. Bizerte show highest concentration in 2005, which is in agreement with the high concentration of suspended sediment in the same years which is linked to a period of very high rainfall ([4], see also Fast Facts).



Aerial photo of the Ichkeul National Park
Source: DGF Tunisia [9]



Source: DEM from USGS [1]
Map composed by Brockmann Consult GmbH

References

- [1] USGS (2011) Global Digital Elevation Model (GDEM) Version 2
- [2] Casagrande, C. and Boudouresque, C.F., 2010. A first quantification of the overall biomass, from phytoplankton to birds, of a Mediterranean brackish lagoon: revisiting the ecosystem of Lake Ichkeul (Tunisia). *Hydrobiologia*, 637(1), p.73.
- [3] Du, J. and Jing, C., 2018. Anthropogenic PAHs in lake sediments: a literature review (2002–2018). *Environmental Science: Processes & Impacts*.
- [4] Jemai, H., Ellouze, M., Abida, H. and Laignel, B., 2018. Spatial and temporal variability of rainfall: case of Bizerte-Ichkeul Basin (Northern Tunisia). *Arabian Journal of Geosciences*, 11(8), p.177
- [5] ESA (2016) Sentinel-2 MSI image
- [6] Odermatt, D., et. al (2015). Algorithm Theoretic Baseline Document (ATBD). ESA DUE Project Diversity II
- [7] <http://www.diversity2.info/products/>
- [8] Bouchouicha Smida, D., Sahraoui, I., Grami, B., Hadj Mabrouk, H. and Sakka Hlaïli, A., 2014. Population dynamics of potentially harmful algal blooms in Bizerte Lagoon, Tunisia. *African journal of aquatic science*, 39(2), pp.177-188.
- [9] DGF Tunisia (copied from <https://medwet.org/2016/09/ichkeul-lake-tunisia-removed-from-montreux-record/>) on 10-01-2019

All water quality satellite-derived products shown here have been derived from MERIS sensor onboard of ENVISAT. The product development and processing have been performed within the ESA projects Diversity-2 and Globwetland-Africa.

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