University Alliance for Sustainability

Final Report: Junior Research Stay at Freie Universität Berlin

Mr. Yile Tao

Peking University

Illuminating Lake Ecosystems

September to December 2016

From September to December 2016, I spent three months at Leibniz-Institute of Freshwater Ecology and Inland Fisheries in Neuglobsow. My supervisor was Prof. Franz Hölker(http://www.igb-berlin.de/en/profile/franz-holker) who teaches at Freie Universität Berlin and leads a research group concentrates on light pollution and ecophysiology.

This visit was an exciting adventure for me. I had a lot of first times during this trip: it is my first time to travel abroad alone; it is my first time to visit Europe and as a Chinese boy born in Shanghai, it is my first time to live in a countryside for such a long time. I enjoyed all the beautiful landscapes along my trip. The oil-painting-like autumn of Lake Stechlin with lovely decorated cabins nearby really made me feel like living in a fairy tale. However, the most exciting part of my visit was the great opportunity to collaborate and exchange ideas with researchers here, benefit from their experience and knowledge.

When Thomas Alva Edison invented Light bulb in the late 19th century, he couldn't predict that the spread of artificial light at night would dramatically increase worldwide and make the night sky hundreds of times brighter in many parts of the world. He also could not predict the global average light emission increased at a rate much faster than the growth rates of the global economy, the world population and greenhouse gas emissions in the last century. There are unexpected impacts on nature from artificial light at night, which may danger biodiversity, accelerate eutrophication and even global warming.

For the first time scientists from vastly different fields will work together to study the ecological, chronobiological, cultural as well as socio-economical aspects and impacts of increasing artificial illumination on aquatic and adjacent terrestrial habitats in Germany. I feel very lucky to have a chance to work here and learn from them. I was also amazed by the IGB Lake lab(Fig.1), a magnificent large experimental facility in Lake Stechlin. It is a huge floating construction that consists of one large enclosure with 30 m diameter and 24 smaller enclosures that are 9m in diameter. Each

enclosure is isolated from the lake by plastic curtains that reach down into the lake sediment at a depth of about 20m, which was used to assess complex responses of lake ecosystems to perturbations of different levels of skyglow and brownification.

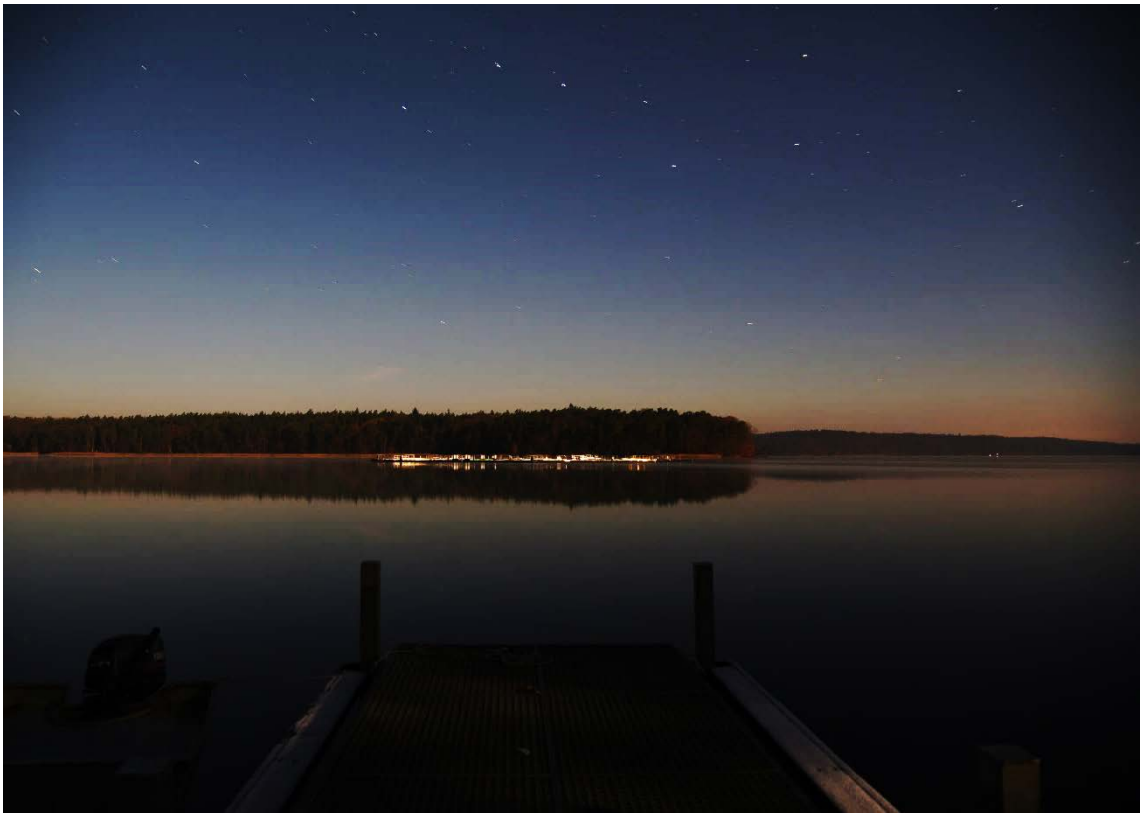

Figure 1. the IGB LakeLab under the Big Dipper

I used flow cytometry to measure the biomass of phytoplankton, cyanobacteria, bacteria, archaea and even viruses in each enclosure from different times. I found out that skyglow significantly increased the biomass of bacteria, which might be caused by the change of productivity of freshwaters. All the sampling on LakeLab were finished in December, 2016. The last sampling was filmed by Das Erste 1. The report about the project was broadcasted both on TV and online on Jan 21, 2016 (http://www.daserste.de/information/wissen-kultur/w-wie-wissen/licht-110.html). I was thrilled to see myself on TV.

The analysis of the experiment is still going on. More and more results including the effects on the lake food web and biogeochemical fluxes of the new light conditions will come out soon. I am sure they will provide fundamentally new insights into lake ecosystems and at the same time important information for future lake management in the face of ongoing climate change and light pollution.