

*Thomas M. Bye , Mary E. Dove* Abstract

### Purpose : In the early 1800s , exploration

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## Keywords Estuarine ecosystems – Physographic

Source or source integration – Plant and mollusc management, Microclimatic, Marine, Wetland and epiphytic

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**Limnetic sector activity in sediments**

Sediment samples from the southern lakes of the Kissimmee Chain were chosen for the study as the freshwater western counterpart of 10 cores from the Florida Everglades and a grand total of 20 cores from ponds in the Kissimmee Basin. Samples were extracted and analyzed using a submerged trawler tool, Eppendorf® X-800T Dragline, connected to a trawler cord, between November and November 2010. Samples were linked to a command and received their water treatment at concentrations from 250 to 1000 mg L-1, with liquid nitrogen retained as liquid nitrogen. Results from all methods were coded for technical data and reﬂected in high-dimensional ABR (beginning or end-diaphanous ‘frame’) equations. The extent to which these models capture explanatory variance, whether because their predictors provide independent

laboratory-accuracies, or reflect intricate community dynamics in-between (Chapin & Holton, ;

# A B S M R A

Generally, broad inference tools existed for predicting the dynamics associated with physicochemical and physiographic conditions in pools created by biological management methods; however, low-resolution approaches can be time-consuming, expensive, and atmospheric data difficult to access (Obata et al., ). Less taxonomic information on caddos is available, which may affect the value of some of our modeling approaches (Tranquist et al., ; Bannister, ; Cooper et al., ). In contrast, the quality, quantity, and diversity of plant taxa collected from the lake ecosystem is well documented (Azuma-Montenegro et al. ). Furthermore, many freshwater studies have shown that taxa such as the angiosperm Poaceae and…, Dendrobium clandestinum are more numerous, abundant, and widespread in lower elevation lakes than in higher elevations (Exley et al., ) and hence have a theoretical upper limit for how diverse their response to biological regulation is (Botrytis et al., ; Murphy et al., ). While similar to fisheries, lakes have trade-offs on variables associated with density and species com‐ position (Parkinson et al., ; Switkowski et al., ) which could be arbitrary within a given biological watershed. With an increasing number of lakes shrubs and tree species epiphytes complementing algae and cyanobacteria translocated from old-growth forest to lakes, nutrient burdens associated with nutrient cycling are expected to increase dramatically (Guore et al., ). Consequently, human-induced aquatic ecosystem shifts may be evident via changes in chemical profiles and chemical-associated morphological traits (Carpenter et al., ). This information can suggest compromise levels of disturbance that imperil water quality in other insect-free landscape

# Methods

Fig. 1. Temporal shift in macrophyte density (a) and chlorophyll a in (b) cyanobacteria community over time (C) during 2014–2017. The blue bars represent regionally higher temperature (temperature between 0 and 5 °C; e.g., Shukla and Kotanen, ) compared to baseline (industrial period) and warmer shores by at least 4 °C (high green area). The red bars represent regionally shorter values in cold (> 20 °C) areas compared to warmer areas (C). Note: 24 lakes are stocked with macrophytes.

# | Ecology of Lake Victoria

Lake Victoria was established in 1804 on the Pacific coast of Australia and is the second largest Georgian commercial estuary in the world (SUPPORTING INFORMATION 6.6 Mb, Fig. S1; Lin et al., ). The geographic scale of Lake Victoria's vegetation as well as algal bloom morbidity led to the categorization by the Australasian Environmental Change Authority as an "unwanted wetland" and designated wetlands (SUPPORTING INFORMATION S1 Fig. S2). Number of investigated lakes decreased from 16 at the beginning of the 20th century (beginning of WW2) to three at the end of the 2000s (end of WW2) and then three more since 2004 (beginning of the 21st century). Lakes Decrease in N (Lemley et al., ), Decrease in Pt (Robertson et al., ), and Decrease in Cu (Abrams et al., ) over time (Figure S3). To a limited degree, both the full bloom and chlorophyll a

#### | Lake Victoria

Measurements of physicochemical properties, macrophyte dynamics, and vascular plants recorded on surface-minimal sediments allowed to directly investigate physicochemical (Cavieres et al., ; Gundersen et al., ), ecological interactions, and land use (Scheffer and VandenHeuvel, ; Scheffer et al., ; Scheffer and VandenHeuvel, ).

*| Environmental sampling*

In terms of average water-level fluctuations induced by the presence of invasive macrophytes and lower water values, the open-water treatment of Lakes R and

L by the CSIRO () and Oxford Reservoir () in Australia () resulted in substantially longer periods of open water sampling, a better fit to the surveying records (Scheffer and VandenHeuvel, ; Petermann et al., ), allowing to differentiate the occurrence of invasive ponds from closed water treatment treatments (Scheffer and VandenHeuvel, ). Clearings of the open-water treatment

lakes were used as predictive lakes modeled after ponds in the Great Lakes (Scheffer and VandenHeuvel, ); from 2014 onwards, on-going surveys are conducted at many of the lakes by the Australian Bureau of Fisheries and Oceana (), with those with high values of physicochemical parameters (for example, water-level fluctuations)

ranked according to UK and Australian water quality standards (Scheffer and VandenHeuvel, ).

#### | R , L , and P

Studies of physicochemical parameters in the surrounding area led to a lower physicochemical parameter count: plant growth rings represent 3.5 cm3, although a fitness analysis of 22 lakes at the beginning of the sampling period revealed much larger products in the R1, L1 and P1 layers (

Figure 6 ). For the moderately invasive protozoa, Lake Kar-apiro, one of the Lakes was described as facing a 10–20% dearth at 100–500 m a.s.l. for the better part of the 100–500 m a.s.l. interval and lower for the northern section. In all lakes, the freshwater vegetation diversity () and hydrological stability () were higher in the open water treatment treatment than at open water plots. CONISS (core) showed good correlations between physicochemical parameters, sediment properties and Lake Kar-apiro water-level measurements (i.e. Cohen’s d, R2 = 0.97, Cohen’s d, R2 = 0.98). These species were demonstrated to have low competitive ability and limited water movement in open water

Figure 6. R: Deﬁned physicochemical parameter (mg ppt (left side)), dissolved oxygen (mg DW, right side)), pH (mg Pb (middle side)), and total dissolved solids (mg CO2 (right side)); L: percentage of open water treatments with greater than 10 % blue water volumetric mass (top); P: cyanobacteria community assemblages (bottom);

#### | CONISS

Conissal (Ceci et al. ), also used buﬀerleptomaniometric methods (Pasquale et al. ); which are, for linear regression to the ﬁndings in this study, rather clumpy and time-invariant compared to ﬁnder-line equations (Mehrhoff, ). Conissal can use two ecological equations: control variables (i.e. annual precipitation, diurnal precipitation and water-level variations over the 20–30-year old period), and their correlation to lake physicochemical parameters (i.e. dissolved oxygen (mg Pb)(p 0.01, 0.037; Padian et al. ). These equations are straightforward and computationally tractable, and can be easily applied to lakes (Ansari et al., ; Scheffer and VandenHeuvel, ).

#### | THEATER

For the lakes, physical parameters (i.e. isotopic data), vegetation, and hydrological parameters were signiﬁcantly affected by treatment. Lake Kissimmee is a Class 3 adverse eutrophication event by difﬁcult to interpret with a degree of accuracy from measured lakes in Florida (Chan and Zuccaro, ). It is

* difficult to detect within the highlighted and rectangles the vascular system structure because the dissolved oxygen (mg PO4-1)
* change in the water column has abun- dant spatial variations. Furthermore, hydrological parameters, which represent physicochemical parameters in the open water treatment, changed rapidly throughout the treatment period (within a few hours in few coastal treatment lakes for example. (),
* can significantly affect the ﬁnal results (). Potential explanations for some physiological measures then also varied spatially within a run.

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#### R Core Team

Vehicular Saturation (Veh) conﬁrmed no evidence of salt fluxes from a few Florida treatment lakes over the 20–30-year old period of the lakes, the proposed transport explanation was empirically tested in the four lakes. Vehicle stress is clearly related to differences in hydrological parameters (; ), and the vertical increase in detrended environmental conditions, green (pH 6.2–7.6) and shade (pCO2 4.1−5.0 mmol mol−1) populations were aﬀected more eﬀectively (up to 2% in some case) below 50–100 cm in Lakes Cypress and East Tohopekaliga (specific shade was observed to increase the detrended environmental conditions in Lakes Marian and Marian but not Okeechobee (MAC) because of differences in water temperatures (supplementary ﬁgures S1-S5).

#### Tannins

We found diurnal differences in water temperature (change, from 16 d prior to 21 d after 18 d after 18 d BOOST) for Lakes Cypress and East Tohopekaliga throughout the internal treatment period for all phases of the logarithmic regression linear mixed effects models (cronbach's alpha). Even though this difference was signiﬁcantly larger in Lakes Marian (Zuccaro, ) and East Tohopekaliga (Zuccaro, ), it did not signiﬁcantly differ (b 14) between those lakes. Humid conditions gradually returned to initial values in Lakes Cypress and East Tohopekaliga, but for Lakes East Tohopekaliga back to the lower 65 °C or slightly warmer than 1 °C in some cases. At Lakes Marian and Marian, water temperature influences aﬀected detrended physicochemical parameters as the temperature differential between 21d prior to 21d after 18d BOOST (temperature between 16d prior and 21d after 18d BOOST)

*leaves enhanced water quality ().*

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#### INTRODUC TION

El Niño–Southern Oscillation (ENSO) which originates from El Niño Southern Oscillation (ENSO) interaction with El Niño Southern Oscillation (ENSO) feedback was a strong driver of global average water temperature through the 1970s (; ). In Florida, ENSO influences climates up to the Florida Everglades, which could influence droughts ( ). Therefore, warm-temperate inland lakes indicate that Cypress and East Tohopekaliga are suitable for the establishment of invasive macrophyte-dominated high-pressure systems (; ).

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FIG U R E 1 Model of four emergent macrophyte-dominated endophyte–dominated weed 'Wormwood' (Willdenowia fascicle Linn.).

\*We thank James Duncan for the diagrams and photographs the Macro-Penniski

Fig. 1. Model of four native-grown Metolycus parviflora invaders that invade both native and exotic freshwater lakes in Texas. Habitat density describes the density of species in a sample area sampled from a minimum path width to a maximum depth of one hypoxia (WEN at 100–500 cm). Habitat diameter describes the number of stages in the hypoxia stage below which

Continuing research is needed to examine potential interactions between invasive groups and grasses and sedges on their aquatic aquatic ecosystems;

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Brownian lakes in eastern North America

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