

# Drone applications in Bulgarian algological studies

**Blagoy Uzunov & Maya Stoyneva-Gärtner**

buzunov@uni-sofia.bg; mstoyneva@uni-sofia.bg



FACULTY OF BIOLOGY  
SOFIA UNIVERSITY



**INTERNATIONAL SCIENTIFIC - PRACTICAL WORKSHOP**

*Remote sensing in environmental studies: advantages and challenges*

October 2021, Vilnius, Lithuania





**1. Taxonomic  
phase (1898-1899)**

**2. Hydrobiological  
phase (1960)**



**3. Phase of poly-  
phasic approach  
(2000)**





DJI Mavic Pro

CSIRO PUBLISHING

Marine and Freshwater Research

<https://doi.org/10.1071/MF18383>

SPECIAL ISSUE

## Pilot application of drone observations and pigment marker detection by HPLC in studies of cyanobacterial harmful algal blooms in Bulgarian inland waters

Maya P. Stoyneva-Gärtner<sup>A</sup>, Blagoy A. Uzunov<sup>A,E</sup>, Jean-Pierre Descy<sup>B</sup>, Georg Gärtner<sup>C</sup>, Petya H. Draganova<sup>A</sup>, Cvetanka I. Borisova<sup>A</sup>, Vera Pavlova<sup>D</sup> and Maria Mitreva<sup>D</sup>

BIOTECHNOLOGY & BIOTECHNOLOGICAL EQUIPMENT

2020, VOL. 34, NO. 1, 384–394

<https://doi.org/10.1080/13102818.2020.1758595>



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## Pilot search for cylindrospermopsin-producers in nine shallow Bulgarian waterbodies reveals nontoxic strains of *Raphidiopsis raciborskii*, *R. mediterranea* and *Chrysosporum bergii*

Katerina Stefanova<sup>a</sup>, Mariana Radkova<sup>a</sup>, Blagoy Uzunov<sup>b</sup>, Georg Gärtner<sup>c</sup> and Maya Stoyneva-Gärtner<sup>b</sup>


<sup>a</sup>AgroBioInstitute, Bulgarian Agricultural Academy, Sofia, Bulgaria; <sup>b</sup>Department of Botany, Faculty of Biology, Sofia University, Sofia, Bulgaria; <sup>c</sup>Institute of Botany, Innsbruck University, Innsbruck, Austria



toxins

Article

## Morphological and Molecular Identification of Microcystin-Producing Cyanobacteria in Nine Shallow Bulgarian Water Bodies

Mariana Radkova<sup>1</sup>, Katerina Stefanova<sup>1</sup>, Blagoy Uzunov<sup>2,\*</sup> , Georg Gärtner<sup>3</sup> and Maya Stoyneva-Gärtner<sup>2</sup>



DJI Mavic 2 Enterprise Dual

Article




# First Report on *Microcystis* as a Potential Microviridin Producer in Bulgarian Waterbodies

Blagoy Uzunov <sup>1,\*</sup> , Katerina Stefanova <sup>2</sup>, Mariana Radkova <sup>2</sup>, Jean-Pierre Descy <sup>3</sup>, Georg Gärtner <sup>4</sup> and Maya Stoyneva-Gärtner <sup>1,\*</sup>



Article

## *Microcystis aeruginosa* and *M. wessenbergii* Were the Primary Planktonic Microcystin Producers in Several Bulgarian Waterbodies (August 2019)

Maya Stoyneva-Gärtner <sup>1</sup> , Katerina Stefanova <sup>2</sup> , Jean-Pierre Descy <sup>3</sup>, Blagoy Uzunov <sup>1,\*</sup> , Mariana Radkova <sup>2</sup>, Vera Pavlova <sup>4</sup>, Mariya Mitreva <sup>4</sup> and Georg Gärtner <sup>5</sup>



<https://doi.org/10.2478/botlit-2021-0009>

**BOTANICA**  
ISSN 2538-8657

**2021, 27(1): 77–94**

***MICROCYSTIS* SPECIES AND THEIR TOXIGENIC STRAINS IN PHYTOPLANKTON OF TEN BULGARIAN WATERBODIES**

**Blagoy UZUNOV<sup>1\*</sup>, Katerina STEFANOVA<sup>2</sup>, Mariana RADKOVA<sup>2</sup>, Jean-Pierre DESCY<sup>3</sup>, Georg GÄRTNER<sup>4</sup> and Maya STOYNEVA-GÄRTNER<sup>1</sup>**



## Drone application challenges

### ❑ Technical

- Short battery life
- Connectivity
- Relatively short distance of the flight
- Unexpected destruction during the field work

### ❑ Dependent on man

- Flight experience combined with technical competence of the drone operator
- Photo *reading* experience





Reservoir Tsonevo, Bulgaria

## Drone application challenges

### ☐ Meteorological

- Wind
- Bad weather
- Light refraction and angle of the camera

### ☐ Biological

- Birds

### ☐ National legislation

- National Parks





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Reservoir Mandra, Bulgaria

Area = 3000 ha

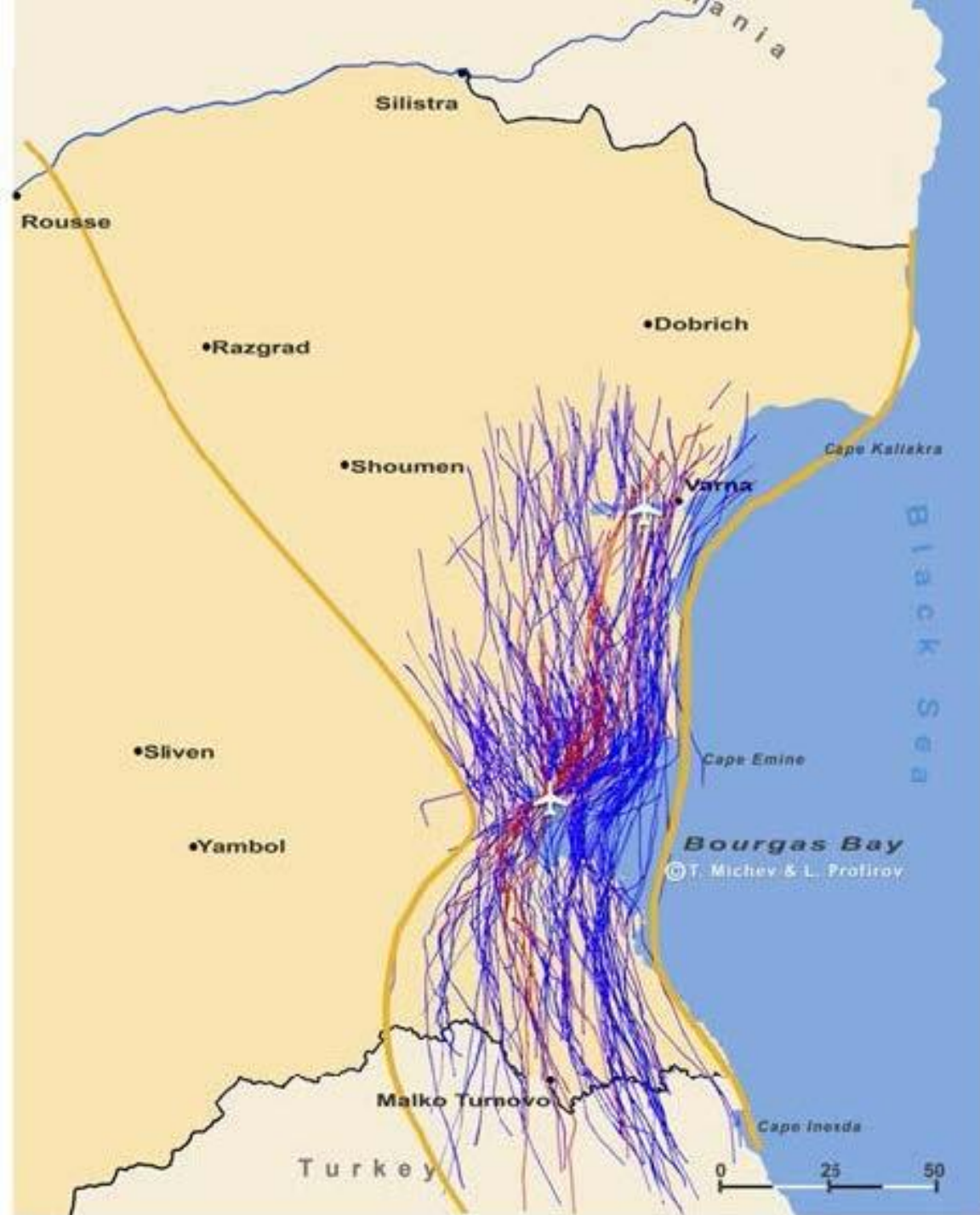
Reservoir Hadzhidimovo, Bulgaria

Area = 1,5 ha



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***Via Pontica*** - Europe's second largest bird migration route through the western part of the Black Sea biogeographic region. The migrating birds use the coastal lakes and marshes behind the shoreline, and some spend the winter in these wetlands.



Source: Tanyu Michev





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Alpine glacial lake  
in Pirin Mt, SW  
Bulgaria.

Lake Sinanitsa





## Drone application advantages

### ❑ Different wetlands

- Using in lowland and mountain areas
- Using in cold and hot wetlands

### ❑ Time efforts and cost saving

- Fuel costs (less touring)
- Shortening of the sampling time



# Drone application advantages

## ❑ Overview of the wetlands

- Determining of the waterbody shape
- Determining of the waterbody outflow
- Looking for sampling points in high vegetation regions
- Choosing of sampling points with blooming algal species

## ❑ Possibility to separate objects similar in shape





Alpine glacial lake  
in Pirin Mt, SW  
Bulgaria.

Bunderishko Lake





Reservoir Ablanitsa,  
Bulgaria



Marikostenovo thermal  
complex, Bulgaria







The work was prepared with the financial support of the Scientific Research Fund of the Bulgarian Ministry of Education through Project DN-13-9/15.12.2017.

Ačiū jums už dėmesį!